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ADMIRAL MELVILLE ON TURBINES.

After several months spent abroad investigating the efficiency of turbine engines as the motive power for war vessels Rear Admiral George Wallace Melville has returned home. As a result of his investigation he does not favor the adoption by this government of the turbines. This form of engine, he says, he believes to be still in the experimental stage and not until radical improvements have been made does he think it will be available. To use his own words, "It is twenty years ahead of its time."

"I shall oppose the building of turbines for war vessels, except for experimental purposes," he said. "The turbine is still in its infancy, and there is not a single engineer that would be willing to stake his reputation on the work of the best one made. The turbine is all right in theory, and it may be in practice, too. So much is still in the experimental stage that the Cunard Line was unable to get any ship building firm in Great Britain to build and guarantee the two 24½ knot boats which it intends to build under the provisions of a British admiralty contract.

"I left this country Jan. 26," the admiral continued, "going to London, where I had long conversations with Lord Selborne, first lord of the admiralty, and with Rear Admiral Sir John Durston, Admiral May, Admiral Oram and Sir William H. White, the naval architect, and also with the members of the Cunard commission, which was appointed to study the turbine. Unfortunately the Cunard commission had been pledged to secrecy, but the English admirals cheerfully gave me all the information possible. From London I went to the ship building plants along the Clyde and to Belfast. At the plants I visited I saw five turbines in course of construction. The boats for which they were intended were to be triple screw boats of about 18 knots. I also saw the two turbines building at Belfast, one for the big steamer being built for the Allan-State Line, and the other for the Irish Channel service.

"The engineers and ship builders of Europe are all deeply interested in the problem, but none of them are satisfied as to the claim of economy of fuel and weight put forward by the advocates of the turbine. None of them have any doubt on the greater economy of space, but while all are anxious to build turbines, none are willing to guarantee anything more than the ordinary speed. They are anxious to install turbines as experiments, but at the same time want to reserve enough space to replace them with reciprocating engines, if necessity demands it.

"There is absolutely no question about the economy of the

turbine for the electrical drive because of its high speed, but as the propellers of a vessel must bear a certain proportion to the cross section of the vessel, the propellers cannot be put in of a proper diameter and maintain this high speed of revolution. Very small propellers could be run at an exceedingly high number of revolutions, but, instead of pushing the vessel through the water, they slip and churn the water around them into foam with no commensurate driving power."

Admiral Melville expressed surprise that the Cunard Line should make this experiment of theirs on so large and expensive a scale.

REMARKABLE PERFORMANCE OF THE PREUSSEN.

The five-masted steel sailing ship Preussen has broken several records since she was launched in 1902 for the Laeis Shipping Agency of Hamburg. She is the largest square-rigged bark in existence and has just completed a voyage from the English channel to Iquique, Chili, a distance of 12,000 miles in fifty-seven days—about the time made by the steam freighters engaged in the South American trade. On this voyage the vessel took her departure from Ouessent March 5 last and crossed the line March 18, thirteen days after, establishing a record never before acquired by a sailing ship. The parallel of 50° S. in the Atlantic was obtained April 10 and in the Pacific April 21, thus consuming eleven days in running the tempestuous region of the Horn. From noon of April 23 to noon of April 24 the vessel laid down 368 miles to her credit, this being the best run throughout the voyage. Ancnor was dropped in the harbor of Iquique May 1, which made fifty-seven days in point of departure to destination.

The two battleships of the Lord Nelson class which the British admiralty is to lay down this year will be the first battleships built from the specifications of Philip Watts since he became naval constructor. With a speed of 19 knots and a maximum coal capacity of 2,000 tons, they will be armed with four 50-ton wire guns firing a projectile weighing 250 lbs. These weapons are to be mounted in twin pairs of barbets and will be supplemented by eight 27-ton quick firers. This will be the heaviest battleship armament in the world and is calculated to give a collective fire energy equal to the discharge of 18 tons of metal per minute. The armor will be 8-in. Krupp steel for the main belting and 13-in. Krupp steel, tapering to about half this thickness for the main gun position. In displacement the ships are retrogressive, as 15,000 tons is placed as the limit.

LIVERPOOL SHIPPING LETTER.



Liverpool, May 5.
—An interesting publication has just been issued by the Cunard company giving valuable information for the use of passengers traveling by the Cunard Hungarian - American line between New York, the Mediterranean and Adriatic. It is stated therein

that passengers may, if they wish, either return by the Cunard steamers from the Mediterranean or Adriatic, or travel overland to Liverpool and return to New York or Boston by Cunard steamers from Liverpool. The journey across the continent of Europe can be so varied, and affords such unequalled opportunity of visiting most of its famous cities, that large numbers of voyagers will probably avail themselves of this alternative. The itineraries shown offer many different routes from the several ports at which the steamers call, viz., Naples, Palermo, Trieste and Fiume to London and Liverpool. Accompanied by pretty illustration, a short description is given of the ports of call, and notes appear in the appendix on many of the cities that can be reached by the routes mapped out. The neat little publication will do much to popularize the new Cunard Hungarian-American service.

In a recent letter I have referred to the building of several vessels to be used as scouts by the British navy, and this week one of these, H. M. S. Sentinel, has been launched from Messrs. Vickers, Sons, & Maxim's Naval Construction Works at Barrow. This British scout has a length of 360 ft. between perpendiculars, a breadth of 40 ft., and at her load draught of 14 ft. 2 in.; has a displacement of 2,920 tons. She has a foremast for signalling purposes fitted with a signal yard and gaff, also a gaff for wireless telegraphy, as well as a trunk semaphore. Her armament consists of ten 12-pounder guns, eight 3-pounder guns, and two 18-inch deck torpedo tubes. The machinery, magazine, steering gear, etc., in the hold are protected by a steel deck in the neighborhood of the water line, which extends for the whole length of the vessel, the sloping sides being 1½ in. thick, and the flat portion of the deck ¾ in. thick. The conning tower is of Krupp non-cemented armor, 3 in. thick. The Sentinel will have a speed of 25 knots and a coal consumption of 4,000 knots at cruising speed. She will be fitted with electric light-

ing throughout, including two powerful search-lights. A feature of the vessel is an ammunition passage under the upper deck which gives the crew transporting the ammunition from the magazines to the guns the protection of the shell plating and the coal in wing bunkers. The total complement will be 286 men. The machinery consists of two sets of four-cylinder triple-expansion engines of 17,000 I. H. P. There are twelve boilers of the Vickers Express type, arranged in three watertight compartments, and the vessel is thoroughly equipped with all the usual auxiliary machinery.

I also gather that three of the new type of torpedo-boat destroyers just built for the British navy by Palmer's Ship Building Co., have been put into commission for dispatch to the Mediterranean station this week, where they will form valuable acquisitions to the destroyer fleet, the Erne and Ettrick hoisted the pennant at Devonport, and the Exe at Portsmouth, and all three will leave for Malta in the course of a few days. The Exe, Erne, and Ettrick are sister destroyers, each built with a displacement of 515 tons, and fitted with engines of 7,000 H. P., propelling them at a speed of 25½ knots per hour. They are equipped with one 12-pounder, and five 6-pounder quick-firing guns, and two 18-in. tubes for discharging torpedoes. They will be the largest destroyers on the Mediterranean station, and are the first of their type to be sent abroad.



PASSENGER SCREW STEAMER FAIRY QUEEN, BUILT FOR SERVICE ON THE CLYDE. DIMENSIONS, 70 FT. OVER ALL, 14 FT. BEAM AND 7 FT. 3 IN. DEEP.

There are evidences of the continued expansion of British shipping, notwithstanding the acknowledged depression in several trades. The tonnage of vessels entered at ports in the United Kingdom from foreign countries and British possessions with the cargoes during the three months ended March, 1904, amounted to 9,115,065 tons, and the amount cleared to 11,325,968 tons, as against 8,470,235 tons entered and 10,697,829 tons cleared in the same period of the previous year. With regard to the coasting trade,

the tonnage entered with cargoes during the three months of 1904 amounted to 7,921,324 tons, and the tonnage cleared to 7,746,094 tons, as against 7,403,620 tons entered and 7,354,645 tons cleared in the first three months of 1903.

During this week the first departures from Liverpool for the St. Lawrence have taken place. The Lake Champlain of the Canadian Pacific railway sailed on Tuesday, and special interest attaches to the departure of this steamer, inasmuch as it was this boat that inaugurated the company's Atlantic service just twelve months ago. There was a large number of passengers in all classes, among them a party of Swiss mountain guides who are going out to the various C. P. R. hotels in the Rockies. The men were in charge of Herr Kaufmann, who said this was his sixth season in conducting parties over the great glaciers in Canada. The popularity of the Rockies,

from a mountaineering point of view, he affirmed, was increasing year by year, the scenery equaling, if not outrivaling that of Switzerland. The men, who hail from the Interlaken and Grindelwald district, seemed well pleased at the prospect of another season in Canada. Other sailings to the St. Lawrence from Liverpool this week are the *Ionian* of the Allan Line, and the *Dominion* of the Dominion Line. These steamers also have large engagements for passengers, but unfortunately the same cannot be reported in respect of cargo, which is not at all plentiful just now.

As I have previously noted, the well known Atlantic White Star liner, *Germanic*, which is undoubtedly the oldest liner of her class in active service, sails from Southampton this week in connection with the American Line New York service. It is to say the least a splendid tribute to Messrs. Harland & Wolff, that a steamer they constructed 30 years ago, should be considered a sufficient substitute for the New York, in the North Atlantic passenger trade. She is still capable of steaming 16 knots, and during her brilliant career the *Germanic* has covered over 2,000,000 nautical miles. On this side she has been styled the "greybeard" of the Atlantic.

The Allan liner *Ontarian*, which left Portland, Me., on the 2nd inst., with a general cargo for Glasgow, and was several days overdue, was towed into Queenstown on Friday morning by the German tank steamer *Excelsior*. It appears that the *Ontarian* lost her propeller in 33° W., and took assistance on April 8, so that the *Excelsior* must have towed her for fourteen days. As the Allan liner is valued at about \$30,000, being of 4,309 tons, built in 1900, and carried a cargo worth about \$750,000, the salvage award is likely to be considerable. Before the news of her passing Kinsale in tow, she was re-insured at 10 guineas per cent. in the British overdue market.

The report of the directors of the Leyland Line, one of the companies acquired by the International Mercantile Marine Co., has just been issued for the thirteen months ending Dec. 31, last. I quote the following from it, which will show what a disastrous year has been experienced. "In the last report it was stated the company's financial year would in the future close on June 30 in each year, but as it has since been found that Dec. 31 is a more convenient date, it has been decided to revert to that date. As mentioned in the last report, there was an outbreak of foot and mouth disease in the New England States of America, and in consequence all shipments of cattle from the Northern United States ports were prohibited. This prohibition continued until the middle of September last, and caused a very serious diminution in the revenue of the company. Throughout the whole year freight rates on the Atlantic have been most depressed, and they continued at an unprofitable level. Strikes at Montreal and New Orleans and disturbances in central America have also greatly interfered with our revenue during the past year. In order to provide for depreciation, pay the debenture interest, and 5 per cent dividend on the preference shares for the six months ending May 31, 1903, it has been necessary to transfer £269,500 from the reserve fund, leaving a balance in that fund of £65,000. Under these circumstances the directors did not feel justified in paying the dividend on the preference shares for the six months ending Nov. 30, last, and this payment has therefore been postponed. The balance at the credit of profit and loss account carried forward is £334 os. 7d." It may be worth noting that the ordinary shares which up to 1902 were receiving dividends at 6 per cent, received nothing last year, while a sum of £65,000 had to be borrowed from the reserve fund in order to pay the preference dividend and provide for depreciation. There are many here curious to know what will become of the Leyland Line when the last penny of the reserve fund has been taken by the preference shareholders. One thing is certain that things cannot long go on as they are.

Mr. Thomas Hall, lately superintendent engineer for Messrs. Elder Dempster & Co., at Liverpool, is about to leave this

country for Montreal, for the purpose of taking up a ship repairing and engineering business he has acquired there. Commander J. T. Walsh, R. U. R., of Liverpool, has already taken up his quarters in Montreal where he will occupy the position of marine superintendent for the Canadian Pacific Railway Co.'s fleet. Commander Walsh is a well known figure in Liverpool, having held the position of marine superintendent for the Beaver Line when owned by Messrs. Elder, Dempster & Co., and was transferred to the C. P. R. service when the line was acquired by the railway company. Capt. Walsh is, however, best known on the west coast of Africa, where he acted as agent for the African Steamship and the British & African Steam Navigation companies for some years, serving also with distinction at the Sierra Leone rising.

I am authoritatively informed that the Manchester Lines (Ltd.), who have hitherto confined their operations to the North Atlantic trade, have decided on a new steamship service, and propose to run steamers from Manchester direct to Monte Video, Buenos Ayres, Rosario and other River Plate ports. The Manchester Lines (Ltd.) now own a fleet of 14 steamers, aggregating a total tonnage of close upon 100,000 tons, and the Manchester Spinner, Manchester Miller and Manchester Engineer have been selected for the first three sailings to the River Plate, closing in Manchester respectively on May 5, May 30, and June 25. The service will thereafter be three-weekly.

There has been launched this week by Messrs Alexander Stephen and Sons, Ltd., on the Clyde, the twin-screw steamer, *Port Kingston*, for the Imperial Direct West India Mail Service of Messrs. Elder, Dempster & Co. The *Port Kingston* is 475 ft. in length, 55 ft. 6 in. in breadth, and 36 ft. in depth, and is constructed to Lloyds and the Board of Trade highest class, with scantlings in excess of requirements. She has a poop, a long bridge house, and a forecastle in the upper deck, the deck over the bridge house being carried out to the side, forming a shelter promenade on each side of the upper deck. Accommodation is provided for 160 first-class passengers in state-rooms, an unusually large number of which are on deck. Several of the best rooms are so arranged that they may be taken as one suite. The main dining saloon will seat the whole of the passengers at one time. It is lighted by windows at the sides and ends, and by a well through the music-room above, and is fitted with furniture and tables in fumed oak, relieved on the walls by panels of warm-toned marble. The second-class accommodations comprises state-rooms similar in design and fittings to the first-class with a dining saloon at the after end of the bridge, large enough to seat the whole of the passengers, some 60 in number. The holds insulated for the carriage of fruit are of a capacity of over 100,000 cubic feet, and are divided up into bins, and refrigerated in the latest and most approved manner. The machinery, which will drive the vessel at 17 knots per hour, consists of two sets of triple-expansion engines, constructed by the builders, and capable of developing about 10,000 I. H. P. I give this short description of the vessel because it is the most interesting launch of the week, and demonstrates that Sir Alfred Jones, the head of the Elder Dempster Line, has lost none of his faith in the future of Jamaica and the speculative venture he undertook in the Imperial Direct West India Mail Service. Lady Sarah Wilson named the vessel, and the Duke of Marlborough, Colonial under-secretary, with Sir Alfred Jones and other leading personages were present at the launch.

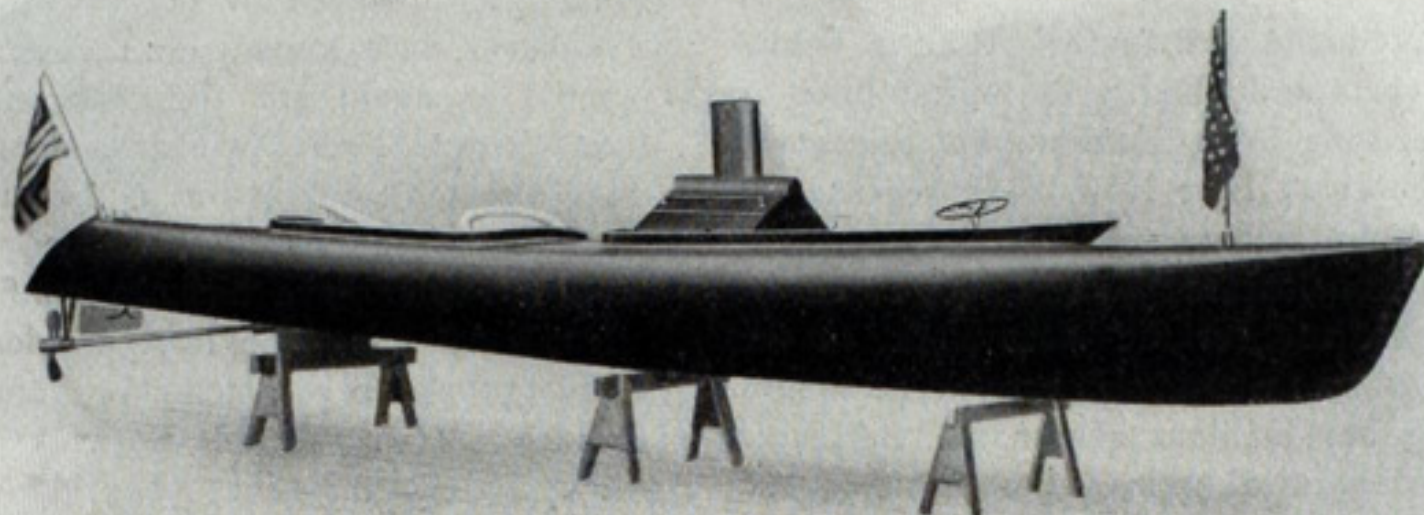
Messrs. Swan, Hunter & Wigham Richardson, Ltd., have booked an order for a new pontoon dock from the Suez Canal Co. The dock is to have a lifting capacity of 3,000 tons, and is primarily intended for use in dry docking and repairing dredges, tug boats, hopper barges and other craft belonging to the company. It is said that the building of this pontoon dock with other work in hand, will keep this yard fully engaged until the autumn, by which time details will have been completed of the new fast Cunarders.

PANHARD AUTO BOAT.

One of the most successful auto boats is the Panhard auto boat built by the Electric Launch Co. of Bayonne City, N. J., for the Panhard-Levassor Co. of France. The picture accompanying this article shows the under body of the boat standing on the launch company's shop floor. This is one of the first typical auto boats built in this country, the order for it having been placed by the Panhard-Levassor Co. late last fall. The boat proved very satisfactory in its trials, a speed of over 17½ miles having been obtained. The weight of the hull is 460 lbs. and that of the engine 600 lbs., making the total

weight with the equipment all aboard less than 1,200 lbs. The Panhard is therefore one of the lightest auto boats that have been built so far. The shell is double planked, having a total thickness of 5-16 in. The company has been agreeably surprised at the strength of this shell in actual service, it having met the fullest expectations of both builders and owners.

The Electric Launch Co. also built the auto boat F. I. A. T., which is owned by Messrs. Hollander & Tangeman, agents for the F. I. A. T. Italian automobiles. The F. I. A. T. has been tested over a mile course and showed a speed of 20 miles an hour. She is built on the same general lines as the Panhard, but is equipped with a 24-30 H. P. motor against a 15 H. P. motor in the Panhard. The company has now under way a number of auto boats, including one for Commodore Harrison D. Moore of the Atlantic Yacht Club, which is to be a 60-ft. boat, equipped with a 175 H. P. engine, designed by Henry J. Gielow, and intended for a speed of 25 miles an



PANHARD.

electric launch for A. Montgomery Ward of Chicago; 95-ft. gasoline cruising launch, equipped with 250 H. P. engine for James Corrigan of Cleveland.

In addition to the private work referred to the company has an order from the United States war department for 120 working boats which if placed end to end would reach nearly

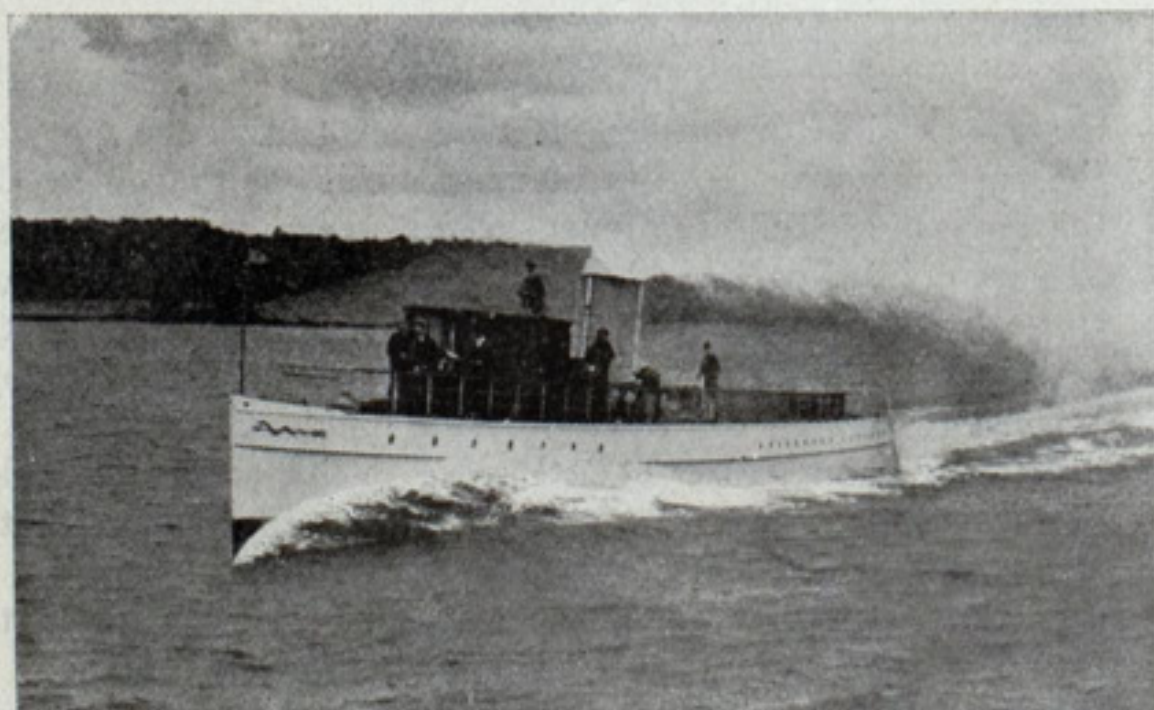
half a mile in length. These boats are well under way and are a type which is being manufactured by the company on a large scale. The company has just delivered to the war department a 30-ft. electric launch for use at West Point.

THE ARROW.

The steam yacht Arrow is probably the fastest vessel

of her kind in the world. She has made 39.13 knots or 45.06 miles per hour over the government course on the Hudson river. The Arrow was designed by Charles D. Mosher, 1 Broadway, New York, and was built for Mr. Charles R. Flint of New York city. She is 130 ft. long, 12½ ft. beam and draws 4½ ft. of water. The yacht has six watertight bulkheads, dividing the hull into seven watertight compartments. Of course, interest centers largely in her machinery, which alone occupies a space of 52 ft. in the hull. She is a twin-screw steamer and is equipped with quadruple expansion engines with cylinders 11, 17, 24 and 32 in. diameters by 15 in. stroke, designed for 600 revolutions per minute. Steam is supplied by two boilers of the Mosher water-tube type, having a combined heating surface of 5,540 sq. ft., 120 sq. ft. of grate surface and allowed 400 lbs. steam pressure. The boilers are each 9 ft. long, 8 ft. 6 in. wide and 5 ft. 10 in. high.

Eight feet abaft the bow is a collision bulkhead, the compartment forward being used as a trimming tank and providing a large storage reservoir for fresh water. The crew's quarters are situated next abaft the collision bulkhead, and extend the full width of the vessel for 15 ft. of her length. Next to the crew's space are located the officers' quarters, consisting of a double state-room, which is also the full width of the boat 7 ft. 6 in. long. Between the officers' quarters and the bulkheads at the forward end of the boiler space is the galley, which occupies the full width of the vessel for a length of 10 ft. 6 in., and which is provided with all the modern appliances and sufficient space for stores for an extended cruise. The stairway leads from the galley to the main deck. The only state-room which occupies the full length of the boat is 7 ft. 6 in. long. Next abaft is the saloon which is 13 ft. 6 in. long and occupying the full width of the boat. It is most luxuriously fitted out. After the saloon is a double state-room fitted in Hungarian ash. The hull of the Arrow is of wood and was built by Samuel Ayers & Sons, Nyack, N. Y., and the machinery by the L. Wright Machine Works, Newark, N. J.



STEAM YACHT ARROW MAKING 45.06 MILES AN HOUR.

hour; a 26-ft. auto boat for a prominent Brooklyn yachtsman; a 40-ft. auto boat for W. B. Hayden of New York; a 31-ft. auto boat for H. H. Rogers, jr., of New York; a 40-ft. auto boat for Hollander & Tangeman, building as the challenger against Smith & Mabley's 40-ft. auto boat for a \$2,000 cup.

The company also has under way a large amount of work in both electric and gasoline launches and yachts. A 21-ft. launch for Tuxedo; 36-ft. cabin launch to be used in the Adirondacks on Upper Saranac Lake; 23-ft. yacht tender for Charles G. Gates for use on his yacht Charmary; 37-ft. electric launch for Raymond Hoagland of Red Bank, N. J.; 30-ft.

The little town of Essex, Mass., is quite busy in its ship building line, notwithstanding the dubious beginning of the year. More than 300 men are employed at the yards and the builders are looking for more employes. At present eleven vessels are on the stocks in all stages of construction. At the yard of Oxner & Story five vessels are in process of construction. Tarr & James have two and A. E. Story four.

MR. S. F. EDGE'S MOTOR LAUNCH NAPIER MINOR.

The racing launch Napier Minor was built at Goring on Thames and lately took exciting part in the April races at Monaco. She is 35 ft. long and 5 ft. beam, and as will be seen from the illustration has plenty of freeboard. She is built on the Saunders Sewn principle of cedar and mahogany with rake beams. The hull is enameled gray and the decks are white, and ample accommodation has been provided for passengers. The boat is divided into two portions, the fore part containing the machinery, consisting of a 53 H. P., four-cylinder standard Napier marine motor by Messrs. S. F. Lodge, Ltd. She is provided with Napier reverse gear and the various accessories are all protected by a long whaleback deck. The steering and control apparatus are all regulated by one man who is well protected by the whaleback. The after part of the boat contains a long cockpit and is fitted with the usual cushions and gratings and has a hood to protect the passengers from rain or spray. The exhaust has been installed in such a manner that its temperature causes no inconvenience to the passengers, and the discharge is invisible and noiseless. The boat has seating accommodations for about fifteen passengers, so that she will not be only useful as a racing boat, and the absence of noise and vibration is extremely marked. With regard to speed it is quite equal to what was anticipated, and can be regulated by means of the throttle down to 3 or 4 knots.

MOTOR DEVELOPMENT

"To cry for the possession of the moon" used to be another manner of expressing a desire for the unattainable. But an urgent demand for anything regarded as a necessity being nowadays immediately supplied by some inventive genius causes one to suspect that the word "unattainable" may soon become obsolete. The perfection of the marine steam engine gave some way occasion to remark that we traveled no longer, but were ever arriving. Said engine, however, not proving suitable for the smaller craft, the gasoline motor was invented for the propulsion of the members of the mosquito fleet in general, and diminutive pleasure boats in particular. At first yachtsmen doubted the optimistic assertions of the motor's far-seeing advocates, and there were several reasons why owners of small boats showed hesitancy about investing in a machine of which nothing was known than that it made a noise out of all proportion to its size. The liability of the exploding of the fuel, and to the latter's odor being hardly suggestive of perfume, were more factors in the decision of an unfavorable verdict to the persistent pleading of the makers of motors. The early type of motor consisted of one comparatively large

cylinder above the piston of which gasoline was exploded by means of an electric spark from a battery. Force only being applied to one side of the piston for every complete revolution of the shaft the violence of each explosion can be readily understood. By consecutive numerous light explosions during each revolution the running of the latter-day multi-cylindere motor causes only a hardly noticeable rumbling. And for the comfort of the passengers as well as the preservation of the boat the almost entire elimination of ceaseless vibration, formerly associated with

this manner of propulsion, is responsible for the up-to-date gasoline motor's popularity. A dynamo furnishes the necessary electricity for the periodical explosions, a battery only being needed at the time of starting the machinery. A device known as a "shifting spark" enables the operator to change the time of the explosion, thus rendering the same service in a motor as does the so-called "expansion valve" in a steam engine. The crankpins, crossheads

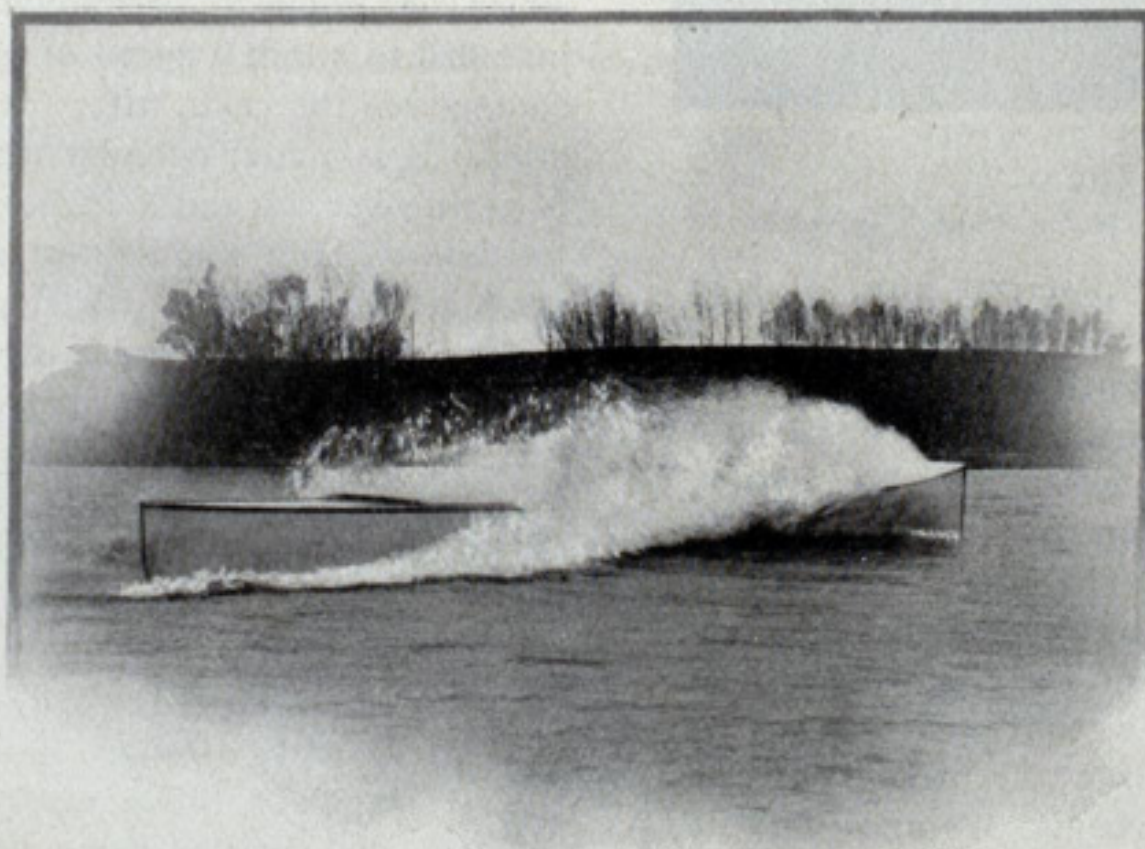
and slides are automatically lubricated, while a small pump continuously circulating a volume of water through the jacket effectively prevents the overheating of the cylinders. Being placed low in the boat any water in the hold has a tendency to gather round the motor, and the man in charge only needs to use this bilge water to cool the cylinders to speedily free his boat. In small boats the fuel is generally stored in the

bow, but, in whatever place the supply of gasoline is deemed most advantageously bestowed, care must be taken to have the lowest part of the tank slightly higher than the cylinders of the motor. When pitching into head seas the lowering of the bow and the consequent elevating of the boat's stern naturally changes the relative position of tank and engine. In other words, the fuel supply being in such a case below the cylinder level a cessation of the flow of gasoline resulted formerly in an abrupt stopping of the motor's activities. The yachtsman who

has equipped his motor with a "carburetor" need never dread an impending disturbance of the water's surface, for a steady flow of fuel to the cylinders is guaranteed even during his craft's most violent contortions. Fastidious boatmen who object to the noise of the exhaust may invest in a so-called "muffler," and thus assure comfort to their sense of hearing. Crank and propeller shafts are generally separate parts, so that the motor can be started while the propeller remains inactive. A "clutch" between these shafts, and operated by a lever, enables the man in charge to cause the propeller to turn in either direction without interfering with the steadily working motor. Some time ago a western manufacturer of motors sent a sample of his product to his eastern representa-



S. F. EDGE'S MOTOR RACING LAUNCH NAPIER MINOR.



S. F. EDGE'S MOTOR RACING LAUNCH NAPIER MINOR.

tive in New York city. Said motor could develop 24 h. p., and for compactness and simplicity was a credit to its maker. After placing it upon the packing case in which it arrived from its place of birth, the agent was importuned by several interested spectators to demonstrate the running abilities of the new arrival. A tomato can served as a storage tank of the gasoline, and without even fastening the motor to its novel and shaky bedplate, the trial run of the machine was unanimously declared a phenomenal success. Needless to add that a motor which, when running at full speed, remains stationary while loosely placed upon a dry goods box cannot be expected to cause vibration when bolted to a boat's bottom.

F. H.

TUNNEL LAUNCH LAURA.

The launch Laura, built by the Clifton Motor Works, Cincinnati, O., is of galvanized steel throughout and is one of the first of its kind built in this country. The hull is 45 ft. long, 6 ft. 3 in. beam and 18 in. draught. The freeboard of the bow is 4 ft., amidships 20 in., and at stern 24 in. The launch is fitted with twin screws each of which is 30 in. diameter, 40 in. pitch. The propellers are placed in tunnels, so that when the boat is at rest the upper part of the blade is about 4 in. above the surface of the water. As soon as the propellers are put in motion the water fills each tunnel, and the propeller



TUNNEL LAUNCH LAURA.

[Built by Clifton Motor Works, Cincinnati, O.]

runs in solid water. This is a very practical form of boat for shallow water navigation and is built after designs by Mr. John I. Thornycroft, the well-known builder of torpedo boats who has made a specialty of the tunnel form of construction. Each propeller is driven by a four-cylinder 16 H. P. Clifton engine, running at 400 revolutions per minute, and the propellers turn outward at the top. The launch has been a success from the start and the company did not find it necessary to make any alterations whatever in the engine or propeller. The speed of the launch is about 12 miles per hour. It is very seaworthy and staunch and can run any ordinary sea in perfect safety. It has cruised thousands of miles on the Ohio river and its tributaries and has gone through shallow water where no other boats of this size could navigate.

BUICK MOTOR CO.'S ENGINES.

The Buick Motor Co., Flint, Mich., report that at the present time they are making only a $\frac{3}{4}$ H. P. two-cycle marine engine and a 2 and 4 H. P. four-cycle marine. Before the end of the season they expect to take up the 8, 12 and 16 H. P. marines. Knowing that the users of engines and gasoline launches are not usually mechanics, the company is building a two-cycle engine that is believed to be as simple as it is possible for an engine to be. It has no valves, no rods, cams, gears or any other like parts or complications. It is simply a cylinder head, cylinder, piston, connecting rod, crank shaft, fly wheel and carburetor. The dimensions of this engine are as fol-

lows: Bore, $3\frac{1}{4}$ in.; stroke, $3\frac{1}{2}$ in.; diameter of crank shaft, $1\frac{1}{2}$ in.; diameter of propeller wheel, 10 in. The engine is $\frac{3}{4}$ H. P. at 450 revolutions, and $2\frac{1}{8}$ H. P. at 750 revolutions. This little engine will drive a 10 in. propeller wheel at 910 revolutions and is called the automobile launch engine owing to the high power derived from it. The company says that it has always advocated a four-cycle engine for marine purposes for the reason that they were much more positive and the valve movement more like the steam valve movement and not having to depend upon the tight crank case to enable them to get a charge of gas in the combustion chamber. The company believes, however, that it is only a matter of time when the two-cycle will displace the four-cycle, owing to its simplicity. The trouble which the company found with the two-cycle engine was that when the bearings became worn and loose, the piston would, on its inbound stroke, force the gases out through the bearings instead of into the combustion chamber, starving the engine. Another great trouble was the firing back in the crank case when the explosion took place in the combustion chamber, after the piston rings have become worn and loose. The company claims that it has overcome these defects. Instead of connecting the carburetor directly to the crank case as low as possible, as is usually the case, it makes this connection up in the cylinder, that is, just below the end of the piston, when the piston is at its highest outbound stroke. When the piston is in this position there is an unusually strong vacuum formed in the crank case, strong enough, in fact, to overcome any leakage that might happen through having loose bearings. A vacuum is formed in the crank case sufficiently strong to force the gas up into the combustion chamber, after having taken out a $\frac{1}{8}$ pipe plug from the crank case. The piston traveling on its outbound stroke forms a very strong vacuum in the crank case and no charge can get through into the crank case until such time as the piston uncovers the mixer port.

The Saunders-Smith Co., Essex, Mass., launched this week one of the smartest-appearing high-speed launches of the type which has come to be known as the automobile boat. It is intended to attain a speed of 20 miles an hour. Buffalo is the name given the craft, after the type of motor with which it is fitted. It is a four-cylinder motor of 15 I. H. P. The launch is 33 ft. over all and 4 ft. beam. Mr. Saunders believes that the hull is both the lightest and strongest launch hull ever put together. Though it is single planked there are lengthwise strakes running the length of the boat and covering each one of the seams. The ribs are very close together within which the engine comes and the result is that the hull is safe and sound and above all, light. The hull is as smooth as a bottle all the way around, there being no keel to protrude beneath the planking. The keel is inside the hull and the planking was done with the boat up side down. The strength of the hull can be estimated when it is known that it is fastened with 10,000 brass screws. It is estimated that the life of such a boat should be thirty years. The hull is divided into two cockpits, the forward being 6 ft. in length, containing a steering wheel and motor, and the after cockpit containing six revolving wicker chairs with arms.

The new 40-ft. power boat for W. R. Vanderbilt is completed at Jacob's yard, City Island, New York. The motor was taken from Mr. Vanderbilt's 60 H. P. automobile. The whole motor is of aluminum, weighing 400 lbs. complete, and has four cylinders. The boat draws only 5 in. and has a long overhanging bow and a corresponding raking stern-post.

A motor boat from which great speed is expected is under construction at City Island, New York. The craft is for Albert C. Bostwick of the New York Yacht Club and is from designs of Tams, Lemoine & Crane. The boat is 50 ft. over all and 5 ft. 6 in. draught.

POWER DORIES.



FISHERMAN'S POWER DORY.
[Built by Camden Anchor-Rockland
Machine Co., Rockland, Me.]

seded by that of fishing from small boats of which a number are carried, putting out from the smack with one or two men. In this dangerous service it is no unusual thing for the boats to become lost in a fog. It is necessary therefore that the power dory should be the strongest and most seaworthy boat which it is possible to build, for not even the most venturesome of fishermen would care to run the hazard of their calling in any other. For the benefit of those not familiar with this type of boat, it may be well to state that as built for this particular purpose, the dory is flat bottomed from 28 to 30 in. in width according to the length, with bottom rockered fore and aft to the extent of $2\frac{1}{2}$ to 3 in.; the stem which is nearly straight breaking at an angle of about 30° ; the sternpiece being of "V" shape and set at about the same angle. The sides, which flare considerably, are built of three planks on the side with a sheer on top from 12 to 16 in., making a buoyant and lively boat in rough water. The seats, which are movable, and the raking ends and flaring sides allow one boat to nest within another so that a set of six occupies no more deck room and but little more height than a single one. As they are launched from the deck, without the use of davits, it is necessary that they would be very light in construction. Of late years the fisherman's dory has come into use on many large sailing yacht in crossing the Atlantic, the regular round bottom tenders and cutters being shipped by steamer and three or four cheap and plain dories being carried in their place as life boats in case of emergency. Within a dozen years or so the dory has come into general favor as a pleasure boat along the Atlantic coast. Fitted with centerboard and leg of mutton sail the dory is by long odds the best rowing, sailing and fishing boat that can be had for the money. With the advent of the small power boat in eastern waters last year, it is but natural that the dory should be tried with a motor, the result of the experiment being most successful. This year a large number of power dories have been built both for pleasure and for fishing purposes. The power dory is inexpensive, seaworthy,

The dory of the New England coast is a craft that does credit to the designers as filling the requirements of a cheap, serviceable and seaworthy small boat. Within the last few years the practice of fishing directly from the deck of a fishing smack has been super-

of shoal draught and of such light displacement that it is easily driven. All these facts make this type of boat popular and dories can now be built and supplied with motors for only a little more of half the cost of a regular launch. These boats are used quite extensively by fishermen for shore fishing. The bow of the new boat is modeled on the knockabout type and with the extra long overhanging stern it makes a very pleasing looking boat on the water. They have a forward and aft deck which serves as compartments for gasoline tank in bow and for batteries and mufflers in the stern.

The E. Gerry Emmons Corporation, Swampscott, Mass., report that they are building quite a number of power boats from 16 to 30 ft. in length. Most of their orders this year are for power dories for which there seems to be a great demand.

These boats cost from \$175 up and many of them are finished in Spanish cedar and mahogany. Both two and four cycle motors are used. The company is now building a 30-ft. power dory with a 5 H. P. Palmer motor for Mr. Rand of New York, and a power boat 30 ft. long with torpedo stern for Mr. Richards of Boston. The company reports that the business outlook for this season is good.



TENDER FOR SCHOONER THOMAS W. LAWSON.
[Built by Camden Anchor-Rockland Machine Co., Rockland, Me.]

Luck solely a famous painting and a story well told; for the power dory of 1904 has made of it a gratifying reality. This light, speedy, and seaworthy little craft has become the successful weapon with which the fisherman now defies the bold seas and the severe climate of our bleak New England coast. The dory outfits on the market today are certainly a credit to the craft; and fishermen, all along the coast, are never happier

FISHERMAN'S LUCK.

No longer is *Fisherman's Luck* solely a famous painting and a story well told; for the power dory of 1904 has made of it a gratifying reality. This light, speedy, and seaworthy little craft has become the successful weapon with which the fisherman now defies the bold seas and the severe climate of our bleak New England coast. The dory outfits on the market today are certainly a credit to the craft; and fishermen, all along the coast, are never happier than when sitting down and spinning some interesting yarn about them. The fisherman has found a good thing, and, with his proverbial bigheartedness, is anxious to pass it along. These little boats are made in sizes ranging from 18 ft. to 35 ft., and have installed in them gasoline motors from $1\frac{1}{2}$ to 9 H. P. respectively. The very severe test which these boats underwent during the past winter has established for them a reputation to which no exceptions may be taken. The writer has observed many a



CLIO.
[Built by the E. Gerry Emmons Corporation, Swampscott, Mass.]

delighted fisherman putting out of the harbor in his wee craft, while the impatient owners of large boats were obliged to moor inside.

If you would be convinced of the popularity of these little dories, it is only necessary that you be upon the wharves at the hour when the fishermen are bringing their fish into market; then you will have an opportunity to observe the numerous little power boats swarming about the landings. These boats are used in several different ways; some of the lobster fishermen have wells built in their boats; some use them as tenders for the larger smacks; while many use them for towing purposes in calm weather, and for hauling the lobster pots, while on the fishing ground.

The accompanying illustration shows a special style of dory, which is manufactured by the Camden Anchor-Rockland Machine Co. of Rockland, Me., who also manufacture the Knox gasoline engine. This company's engine, owing to its special model, is a great favorite among the fishermen.

The dory is not only meeting with success among the working classes, but is being used to quite an extent as a pleasure



LAUNCH.

[Built by the E. Gerry Emmons Corporation, Swampscott, Mass.]

craft, some of them being fitted up as nicely as any up-to-date launch. The fisherman has lately taken a keen interest in the speed question, and this summer will probably bring forth races that will be as much talked of as the now popular auto boat races. The speed will be, of course, deficient, but who shall question the excitement produced and the spirit of rivalry created?

CONTEST FOR BRITISH INTERNATIONAL CUP.

The British international cup, which was formerly known as the Harmsworth cup, is regarded by patrons of the auto boat as emblematic of the championship. It was raced for last year in Queenstown harbor and won by S. F. Edge's Napier. This year the race will be on the Solent on July 30, and an American boat is to be a competitor. Two boats built on this side have been entered, and there has been talk of a third, but it is not probable that more than one will be sent across the ocean. The Vingt et Un was the first entered, but it was thought by Smith & Mabley, who entered that boat, that a faster one could be turned out, and so another has been built from designs by Tams, Lemoine & Crane, and this boat, it is expected, will prove to be much faster than the Vingt et Un, and will be the one selected to race for the cup.

This boat is 40 ft. over all, and has a beam of 4 ft. 6 in. Like all these auto boats her draught is very light, and in her construction every ounce of weight possible has been saved. She has a plumb stem and stern, and aft she is shaped like the torpedo boats. The boat is of the ribbon carvel construction, and while she is very light she is well braced and will stand all the strains she is put to. She will be driven by a 75 H. P. Simplex motor, and the total weight of the hull, motor, boat, crew and gasoline will be only 2,400 lbs.

The hull is decked over, with the exception of a small watertight compartment, for the helmsman and the motor space. This space will be covered with rolling canvas to protect the motor from water that may be taken over the bow. The boat will be steered by a vertical wheel and handled from the cockpit. As soon as finished she will be tried with the Vingt et Un and other boats, and when she has given satisfaction she will be shipped to the other side to get ready for the races.

Each country, according to the rules, can be represented by only three boats in the race. France has entered several boats, and so have British autoists, so that eliminating races will have to be held to select the three that are to represent these two countries. Should the American boat be successful, the next race for the trophy will be in these waters next summer. It is possible that the Smith & Mabley boat will take part in the races for the American Power Association

cup, which are to be held on the Hudson river, off the Columbia Yacht Club house, beginning on June 23.

TO PREVENT ROLLING OF SHIPS.

The name of Herr Otto Schlick is well known amongst marine engineers in connection with the admirable modern methods of balancing marine engines, but he is now giving to engineers and naval architects further food for thought in suggestions as to the possible effect of gyroscopic flywheels on board ship in damping, and thus controlling, the excessive rolling of vessels in a seaway. These suggestions, theorized and worked out in a very practicable form, he has given to the Institution of Naval Architects, in a paper entitled "The Gyroscopic Effect of Flywheels on Board Ship." To practically elucidate the subject to his readers, he explains by diagrams and without any abstruse verbiage, the well-known effect of the gyroscope top, and from that proceeds to known illustrations of effect in the bicycle and the paddles of a paddle steamer. It is well recognized that a paddle steamer is steadier in a seaway than a screw steamer of the same build, but Herr Schlick takes to himself the credit, and, we think, rightly, of pointing out that this steadying effect is due to the gyroscopic effect of the paddle wheels, though they revolve at only a moderate speed. He then develops the suggestion of a large horizontal flywheel, supported in a pivoting frame, and braked as to its movements in the hold of a sea-going steamer, for the damping and control of the excessive rolling of the hull. As it is pointed out, excessive rolling is an accumulated or aggregate effect, and a small amount of damping, immediately such rolling tends to develop, will probably suffice to check the accumulation of effect, and thus to prevent excessive rolling altogether. Nor would the apparatus need to be unduly massive. He gives an example of a flywheel a little over 13 ft. in diameter, and weighing nearly 10 tons, applied to a steamer of approximately 6,000 tons, with a peripheral speed of rotation of 656 ft. per second, and calculates that the angle of swing would be reduced after one oscillation to three of the starting angle, and that without any assistance from the frictional resistance of the water. The period of oscillation of the vessel is also materially increased. The flywheel could be driven by a small turbine engine or electrical motor, and the braking of the movements of the frame could be effected hydraulically. The suggestion is at least a most interesting one from a scientific point of view, and probably well worth experimental development.

When the Robert Fulton celebration takes place in the harbor of New York in 1907, some strange looking craft will be seen if the present program of the committee is carried out. It is the intention to have the Claremont duplicated and cruise about the harbor together with John Fitch's eight paddle steamboat and various other vessels that have marked the development of steam navigation. Mr. Aaron Vanderbilt, of No. 42 Broadway, New York, is at the head of the committee of the Board of Trade which has already put itself in communication with Mayor McClellan and President Furness, of the Board of Aldermen. Mr. Vanderbilt believes that if a popular demand can be created for this celebration it will be the greatest thing of the kind that New York has ever seen. Mr. Lewis Nixon says that considerable time will be required to hunt up the models of these vessels and build their duplicates in actual size. He thinks, however, that it would be well worth while.

The twin-screw steel steam yacht Visitor, building for W. Harry Brown of Pittsburg, was launched from Lawley's ship yard at South Boston last week. The Visitor is 98 ft. over all, 93 ft. on the water line, 14 ft. beam and 4 ft. 3 in. draught. She is beautifully fitted up between decks and will make a fast cruising yacht.

THE CHASE PULLEY CO.

The Chase Pulley Co., Providence, R. I., are building a speed launch for Mr. Frank Croker of New York from designs by Mr. Charles F. Herreshoff of New York city. The launch is to be equipped with two 20 H. P. Rochet-Schneider motors; a speed launch designed by C. F. Herreshoff, to be 40 ft. over all and 5 ft. wide; a speed launch designed by William H. Hand, Jr., of New Bedford, Mass., to be 26 ft. over all, 6 ft. beam, and to be equipped with a 6 H. P. Rhode Island motor; a launch designed by W. H. Hand, Jr., for Goff Bros. of Riverside, R. I., to be 35 ft. over all, 10 ft. wide and to be equipped with a 9 H. P. Rhode Island motor; a knockabout for D. D. Allerton of New York city for the 22 rater class of the Atlantic Yacht Club; a launch designed by Burgess & Packard of Boston, to be 23 ft. over all and 5 ft. beam; an auxiliary launch designed by Burgess & Packard for G. F. Holmes of Plymouth, Mass., to be 35 ft. 6 in. over all, 22 ft. water line and 10 ft. beam, to be equipped with a 6 H. P. Murray & Tregurtha engine; an auxiliary launch for Prof. Lowell of Cambridge, Mass., to be 42 ft. over all, 26 ft. on the water line and 10½ ft. beam, to be equipped with a De Dion motor; a knockabout designed by George Owen of Toronto, Ont., for Charles F. Tillinghast, Providence, R. I., for the 22-ft. sail-about class.

A KEROSENE MOTOR HIGHLY COMMENDED.

F. W. Ofeldt & Sons, foot of 25th street, South Brooklyn, N. Y., are building a 20 H. P. Ofeldt improved vapor motor for the launch Spark, owned by Mr. Augustus Hemenway of Readville, Mass., who has had one of the company's launches for the past three years. This is a very compact motor of high horse power compared with its weight and constructed so as to be placed either astern or amidships. The generator, which is made of copper coils, is arranged so as to give the greatest efficiency for the amount of fuel consumed. Having a forced circulation, it is impossible for the coils to become clogged. The covering consists of two thicknesses of asbestos, one of iron casing and an outer casing of nickel steel. This prevents any radiation whatsoever. The burner used is one of the company's blue flame kerosene burners, which has been on the market for the past two years and is a pronounced success. In this burner the kerosene under pressure is converted into gas by passing through a heated coil. The gas then passes through a pin hole nozzle into a mixing chamber, where it is scientifically mixed with air, so as to give the desired combustion and blue flame without any noise. It is started by a torch conveniently placed under the burner. The engine, which is capable of making 600 revolutions per minute, is of the modern compound type, the cylinders being arranged at an angle so as to do away with any dead center. The company claims that experts consider this motor the best of its type ever manufactured.

HUNTER BOAT MANUFACTURING CO. BUSY.

The E. Hunter Boat Manufacturing Co. of Chicago have several sail boats under way but the major portion of their work is launches. They are building a cabin stern wheeler for Mr. George J. Sayer of Chicago, to be 35 ft. long, 7 ft. 6 in. beam and 12 in. draught, to be equipped with a Buffalo engine. The lavatory and galley will be in white enamel and the interior will be finished quite elaborately. The launch will have an electric searchlight. The company is also building a passenger

half cabin launch 38 ft. long and 9 ft. beam for Mr. Augustus Larson of McHenry, Ill. She will be a stern wheeler and is intended for very shallow draught. She will have a Piggins Bros. double cylinder engine of 10 H. P. The launch will be of white oak with an inside finish for rattan chairs and will be ready to launch May 15.

A 21-ft. propeller with torpedo stern is also under way for the Rev. Gilbert Frederic. A Buffalo engine will be installed in



A GASOLINE LAUNCH ON THE STOCKS.

[Built by Chase Pulley Co., Providence, R. I.]

her. The company has several automatic boats under way designed for a speed of 12 miles per hour. They are each 20 ft. long and 3 ft. 6 in. beam and equipped with 4 H. P. engines. The company reports that it is having quite a run on this boat as it is especially designed for low cost construction and can be shipped in an ordinary box car and delivered to any point in the world.

Mr. W. K. Vanderbilt, Jr., is having built at Jacob's yard, City Island, a launch 40 ft. over all, 30 ft. on the waterline, to be equipped with a 60 H. P. Morse engine. All the frames which are of oak are steam bent, the planking is double of elastic cedar, and the turtle deck is of mahogany. It is expected that the launch will make 20 miles an hour. Mr. W. Gould Brokaw is also having built at Jacob's yard a launch 65 ft. over all, 7 ft. beam and 3 ft. draught, to be fitted with a 200 H. P. motor of French make. At this yard also a launch 40 ft. over all, 6 ft. beam and 5 ft. draught, including propeller, is being built for Mr. James C. Martin. Motor will be 35 H. P. built by Smith & Mabley.

A steam yacht which Sir William Armstrong & Co. have built at Tyneside for the Sultan of Turkey is now ready to sail for Constantinople, a harmonious and practical combination of western utility and eastern magnificence. To satisfy the oriental love of warmth and color, rich grained woods have been used. Eighteenth century renaissance is the prevailing style of the interior furnishings. The imperial entrance and the imperial saloon are on the upper deck. Both are paneled at the entrance with finely inlaid Italian walnut and the saloon with oak enriched by gilt moldings. The silk and velvet hangings, the seats and the carpets are all in crimson. The drawing room is of mahogany inlaid with gilt and the skylight is of stained glass. The hangings in this room and the Genoese velvet seats are also in crimson. The piano and arm chairs and tables are in the old English style richly inlaid with gold moldings.



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The Merchant Marine Commission appointed by congress to inquire into the state of American shipping will hold its first public meeting on Monday next at the rooms of the New York Board of Trade and Transportation, 203 Broadway, New York. The members of this commission are Senators Jacob H. Gallinger, New Hampshire, chairman; Henry Cabot Lodge of Massachusetts, Bois Penrose of Pennsylvania, Thomas S. Martin of Virginia and Stephen R. Mallory of Florida; Representatives Charles H. Grosvenor of Ohio, Edward S. Minor of Wisconsin, William E. Humphrey of Washington, Thomas Spight of Mississippi and Allen L. McDermott of New Jersey. Under the act creating this commission it is instructed to investigate and to report to congress on the first day of its next session what legislation is desirable for the development of the American merchant marine and American commerce, and also what change or changes should be made in existing laws relating to the treatment, comfort and safety of seamen, in order to make more attractive the sea-faring calling in the American merchant service.

In the circular sent out by the commission, Mr. Winthrop L. Marvin, the secretary, says: "The commission is familiar with the hard fact of the decline of our ship building and ship owning for foreign commerce; it seeks specific, practical suggestions as to how that

decline may best be arrested and the old maritime strength of America regained."

This commission has much work mapped out for it and it will have to strain every nerve to encompass its subject by the time congress meets again. It will find American shipping and ship building at their lowest ebb and this in spite of the fact that the country has enjoyed a season of prosperity such as has been visited upon no other nation. It will find that an indulgent congress has appropriated millions, nay even billions, for the support of various departments of the government and various industries of our national life but not one cent for shipping. The reason why shipping and ship building are of such insignificant dimensions in what is by nature the greatest maritime country in the world is due to discrimination against shipping exercised by that same congress. So long as the United States remains a protective nation and fails to protect its shipping, shipping must struggle against unequal conditions thus artificially created. If one industry is protected, in strict justice all should be protected, or else the handicap imposed upon the unprotected trade should be compensated for in other ways.

What will this commission find in its inquiries?

It will find that Egypt, which is not even an independent nation, sends as many ships through the Suez canal as does the United States.

It will find that even Austria, with a coast line so small that it would take a microscope to discover it, pays an annual bounty of \$2.44 per ton to all iron and steel ships flying the Austrian flag.

It will find that the United States government last year appropriated \$750,000,000, of which only \$980,000 went to ships and that for carrying the mails.

It will find that an American citizen in South America cannot reach New York without first going to Liverpool.

It will find that a manufacturer of harvesting machinery in the inland states cannot send a reaper to the great agricultural districts of South America without first shipping it to England.

It will find that of the enormous export of grain out of New York, not a bushel has gone abroad in certain years in an American vessel.

It will find that our vast export trade is dependent entirely upon foreign vessels. This is the most important consideration of all and should not be dismissed lightly. Should European wars occur, which are not improbable, it would plunge this country into such an industrial panic as the world has never known. It would be impossible to send the vast sum of our exports abroad. The exports would remain at home to overrun home consumption with the result that every furnace would be banked and every mill dismantled. There are no ships carrying American products but foreign ships.

The commission will find that the United States has pledged itself to pay \$200,000,000, and no one knows how much more, for the construction of a canal across

Panama, which will be used in great part by the foreign carrier. This canal is, of course, a necessity and is in line with progress, but it is a pity that the builders of it may not reap the full advantage of its construction.

This whole question of the merchant marine of the United States should be approached in a big way by the commission. The view should be all-embracing. It should not look to a section but should survey the entire country. It is a national question affecting Montana quite as much as New York; affecting Illinois quite as much as Pennsylvania. The ship builders and ship owners of the Atlantic coast are not the ones most concerned. The ones most concerned are the manufacturers and farmers of the west who realize how fearful is the handicap imposed upon them because of the numerical weakness of the American ship, because they know that the products of their field and their factories are produced without the assurance that they may reach the markets abroad. They cannot now reach these markets except through the sufferance of other nations which may be withdrawn without warning in times of international difficulty.

"THE MAN AT THE WHEEL."

There are trusts and trusts.

The common conception of a trust is that it is an institution which perfects a corner in some article for which there is a demand and that can only be supplied through the trust's representatives and at the trust's price.

That is all there is to it, and is a simple, comprehensive definition with which all must agree.

Some trusts are worse than others though.

Much worse.

We hear a good deal of the Standard, United States Steel, Northern Securities, etc., but what does it all amount to in comparison?

In comparison with the most wicked, illogical, vicious and far-reaching trust of all, that is sapping the vigorous vitality of this hustling and glorious country, and is by common consent doing more real harm than all others combined ever thought of.

The labor trust has become such a inconceivably monstrous evil, permeating every phase of our political and social life that its importance overshadows and obscures all other issues in our country and makes them as a mustard seed to the Great Pyramid in comparison.

That is about the right comparison, too.

Think it over and see if you don't agree.

How few of us after all are brought into direct contact with the great consolidations, and when we are we get a prompt, direct reply as to prices, conditions, etc., and we can take it or leave it alone, just as we like.

There is no uncertainty about it.

We knew besides what it would be before we started.

We were in touch with the situation in a general way and we knew that if we wanted the goods and had the price, that was all there was to it.

And we also knew that the other fellow was getting just about the same sort of a deal.

They do not say to you that you have to buy from them at exactly their own price or they will sandbag you, and not only refuse to sell to you but refuse to permit any one else to

sell you anything or allow you to buy from anyone else or even permit you to do any business at all of any kind.

At least it has not come to that yet.

The Northern Securities Co., for instance, does not say to the freight shipper or the passenger that he will be mobbed and driven out of business and all his rights as an American citizen taken from him if he fails to ship some freight or do a lot of traveling over the lines controlled by that company.

And we heard a good deal about the Northern Securities Co. and the way it was trampling on our rights, etc.

And a lot of people who never "saw the company," any of the stock, or anything belonging to it, and who were not hurt, talked the loudest.

The president of these United States got pretty badly worked up, his cabinet, every one of them, became alarmed, both houses of congress and every judge and lawyer in the country and a few million citizens as well, got to taking a lively interest. The newspapers published columns, the stock market lost its head, and business generally everywhere felt the effect of the strange, mysterious influence that was more imaginary than real after all.

At last it was decided, and possibly if it had been decided the other way the result might not have been very different.

And no one was hurt.

Not a wheel stopped.

Not a man lost his job.

Just as much freight was carried.

Just as many passengers traveled.

Just as much raw material was consumed.

And yet we all got very anxious.

That refers to one kind of a trust.

And how we lose our heads at times and business gets worked up to the point of frenzy over a question that may after all have more of the sentimental than the practical behind it.

But this country is today threatened by a trust evil that is throttling its very life; is more extensive and far-reaching in its hydra-headed ramifications than all the others could possibly be if they were combined in one, and every sensible, far-sighted, impartial, well-informed citizen must admit it.

No use dodging.

Come right out in the open and acknowledge it and get busy if you can, and use your influence to assist those who have the good of the country at heart to grapple with the monster, abstract its fangs, destroy its tentacles and render impossible its parasitical tendencies.

Pretty high strung language perhaps, but we'd use stronger if we knew how.

But is this not the truth after all.

Let us pass over the fearful paralysis caused by the large strikes in the building trades in Chicago, New York, Pittsburgh and other centers during 1903, that cost millions directly and indirectly as a result of their far-reaching effect upon the manufacturers of material all along the line right back to the forest and the farm, and affecting a large proportion of the entire population of the country.

Let us pass by the extent to which the present depression has been brought about by the labor agitation and feeling of unrest and uncertainty that penetrates every portion of the business community, especially the financial interests which control the industrial mainspring and are so sensitive to anything that touches the present business or future outlook.

Let us overlook for a moment the thousands of working men who are to be idle in so many directions as a direct result with all its attendant inconvenience and misery.

Let us overlook the all-important fact that as a direct result of the agitation for unreasonable conditions there is less work and the probability of lower rather than higher wages, longer rather than shorter hours.

But let us think for a moment of the situation on the great lakes where 65 per cent of the tonnage flying the stars and stripes is located.

To begin with, a close study of the situation will demonstrate that not at any other time or at any other place in this country have organized employees made such an effort to obtain conditions as impossible from an employers' standpoint, or have they been as radically inclined as have the Masters' and Pilots' organization in the difficulty now attracting national attention and affecting directly and indirectly hundreds of thousands of people in the United States.

It is not alone the situation brought about by the demands of the captains and mates for a radical increase in their compensation to a figure that for a short season of six or seven months is greatly in excess of what is paid upon the ocean for similar service for the entire period of twelve months.

But it is the autocratic position assumed by a body of men who have always hitherto been the owners' representatives on the ships, but who now by the very character of their demand, cast their allegiance to their employers aside and publicly proclaim that their association and its attendant influences and obligations must come first.

In no other industry or in no other part of the world, even among the most ignorant, narrow-minded and radically-disposed, has there ever been put forth such propositions as have been insisted upon in this case by men who have hitherto been regarded as being clear-headed, responsible, trustworthy and deserving of every confidence.

The loss of this feeling of trust and respect that the employer and owner of the ship should have in his personal representatives, the captain and the mate, during the season, is a loss that even under the most favorable conditions is going to take a long time to regain.

The idea promulgated by the Masters' and Pilots' Association in a circular letter dated April 12, that all members of their organization who had not been notified prior to Jan. 15 last that they would not be re-employed for another year, must go back on the same boat as in 1903, is the most absurd and far-reaching suggestion we have ever heard of.

Not only was it made retroactive in an impossible way, but carries a penalty that if not agreed to and any other captain was appointed, that boat would not be allowed to sail during this season and that the captain who had been in charge in 1903 should receive his full season's compensation whether working or not.

In other words, unless the large corporations and the small ones as well, who own and operate the fleets carrying the commerce of the lakes, agreed to absolutely turn over their vast interests valued at many millions of dollars to the control of this association and its leaders, now and forever more, that the owners of said fleets would not any longer be allowed to operate them or conduct any business requiring the services of any of the members of the Masters' and Pilots' Association on the great lakes.

That is to say, if the masters and pilots could help it.

But they may not be able to help it.

The owners of the lake steamers have had this season to make contracts with seven different labor organizations.

These are as follows:

The Scoopers' Union.

The Marine Firemen, Oilers & Water Tenders' Union.

The Lake Seamen's Union.

The Marine Cooks & Stewards' Union.

The Marine Engineers' Association.

The Longshoremen.

With six of these they made arrangements, and while not satisfactory in many cases, the employers conceded perhaps more than they should have done for the sake of peace.

The masters and pilots, however, refused every fair offer, and as a result, here we are near the first of June and the great interests involved with and dependent upon the ore, coal and wheat carrying trade of the great lakes are all practically at a standstill.

Thousands of men at the mines and engaged in loading ore in the upper lake iron ore country are affected, together with storekeepers and business men who are entirely dependent upon the money that goes into that territory from this trade.

Thousands of men employed on the boats in other capacities and those depending upon them are affected.

Thousands of employees at the lower lake end of navigation, and their families, are suffering.

And all that the Masters' and Pilots' Association may be able to compel a recognition of an absolute power that would eventually result in establishing precedents that would kill off the marine industry and ruin or injure hundreds of thousands of those affected by it.

Talk about trusts.

Whenever did any of those mentioned in the beginning of this article attempt such a wholesale setting aside of the rights of others and trample rough-shod over the interests of the business man and the working man alike?

And we do not hear that there will be any special sessions of congress or supreme court injunctions either.

Where are we drifting to?

Next.

FORT WILLIAM ELEVATOR SERVICE CRIPPLED.

Fort William, Ont., May 16.—One rather unpleasant feature in connection with last Friday's elevator fire here, by which wood grain elevator "B" belonging to the Canadian Pacific road was destroyed, is that the power plant of elevator "A" which operates "C" also, is disabled, and cannot be run. This leaves elevator "E," the only grain house at the Canadian head of the lakes that the Canadian Pacific railway can ship from, and shipments should be active now. No announcement of the policy of the company as to reconstruction has been made, but it is reported from Winnipeg that a fire-proof working house and a series of steel or tile bins will replace the old house, which was of the style of wood construction in vogue some years ago. The house destroyed was built in 1888. The capacity will probably be increased.

From two to three grain cargoes have cleared from Fort William and Port Arthur every day for a week past, and the stocks of grain have been materially reduced. A large amount has been sold for export and eastern shipment. Ships have cleared from the Canadian Northern railway elevator at Port Arthur drawing 17.5 ft. and have had no trouble. There had been some fear that low water might impede navigation there. About 6,000,000 bu. wheat is in store at this place and Port Arthur.

The contract signed by the Lumber Carriers' association and the Lake Seamen's union provides that watchmen and wheelmen on steamers and sailors on tow barges are to receive \$45 per month until Oct. 1 and \$65 for the remainder of the season. Sailors on schooners will receive \$2 per day until Sept. 1, \$2.25 for the month of September and \$2.50 for the balance of the season.

LAUNCH OF THE TURBINIA.

The turbine steamer Turbinia, building for the Turbine Steamship Co. of Hamilton, Ont., was launched from the yard of Hawthorn, Leslie & Co., Hebburn-on-Tyne, recently. She was christened by Miss Agnes Henderson, a cousin of Mr. J. Moodie, who is the president of the Turbine Steamship Co. Among those who witnessed the ceremony were Sir Benjamin C. Browne, chairman of Hawthorn, Leslie & Co.; Mr. W. J. Pilmore of the Parsons Turbine Co.; Mr. C. W. Bigge, secretary of Hawthorn, Leslie & Co. and Mr. J. Moodie and Capt. Crawford, representing the owners.

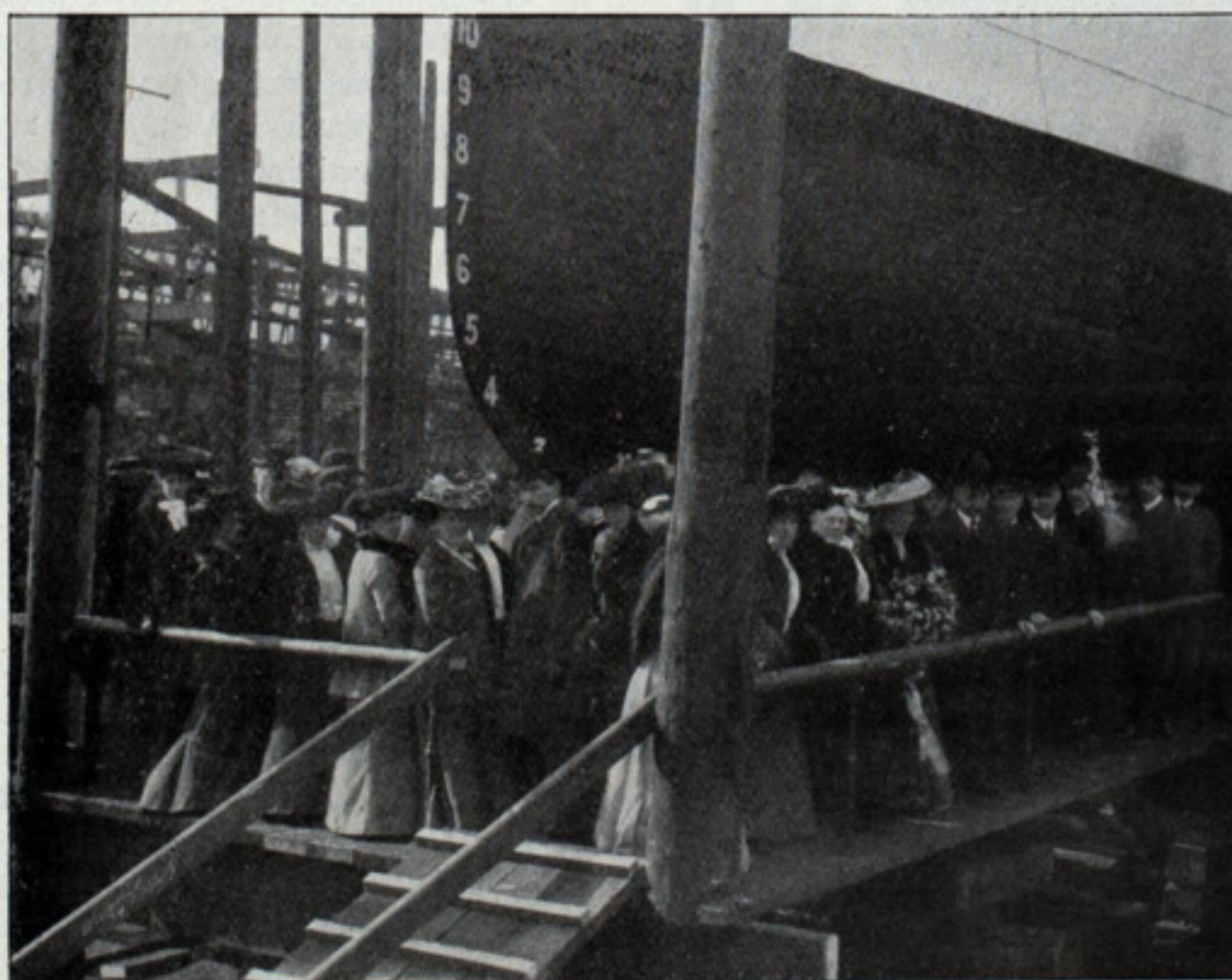
The Turbinia is intended to inaugurate a fast service between Hamilton and Toronto. She is, of course, of Canadian-canal size, being 260 ft. long, 35 ft. beam and 20 ft. 9 in. deep, with 1,200 tons displacement. She is especially roomy and will carry 2,000 passengers. As there is about 40 miles of open sea between Hamilton and Toronto it is expected that the Turbinia can maintain her maximum speed for the greater part of the journey. The steamer is beautifully decorated throughout. A spacious saloon panelled in polished mahogany will be situated on the main deck aft, and will be arranged so as to form ten comfortable bays. This saloon will be lighted by large plate glass windows in the sides of the vessel and by electric light at night. In close proximity to the saloon are the tea and ladies' rooms,

and below the saloon on the lower deck will be a large dining saloon with ample seating accommodation, the galley and pantry being arranged forward of it. A bar lounge and a smoke-room on the promenade decks are set aside for the gentlemen. On the main deck there is a house forming a large entrance hall, the gangway doors for passengers leaving or joining the vessel being placed at each side. Cargo will only be carried on the main deck.

The promenade deck will have a fine reach of clear space forward and aft, and there will be a large well-lighted shelter forward. The hurricane deck will also be available as a promenade deck, being clear from end to end except for the space required for stowing life-boats and life-saving appliances, and for the captain's quarters and wheel-house, forward. The whole of the accommodation will be heated by steam and the vessel lighted throughout by electric light, a powerful searchlight being fitted on the bridge. The engines of the new vessel will consist of three Parsons compound steam turbines, viz., one high-pressure turbine in the center line of the ship, and one low-pressure on either side. Each turbine will drive an independent line of shafting, and there will be three propellers, i. e., one of each shaft. The reversing turbines, which are of considerable size, are incorporated in the low-pressure turbines. Steam will be supplied by two large cylindrical boilers, and the propelling machinery will be



STERN VIEW OF THE TURBINIA.



LAUNCHING PARTY AT THE LAUNCH OF THE TURBINIA.

capable of driving the vessel at a speed of about 21 miles per hour. The vessel has been built both to the British Board of Trade requirements and to those of the Canadian government, and will begin service in the spring of this year, and considerable interest in her is being displayed by Canadian and American ship owners.

NEW RULES.

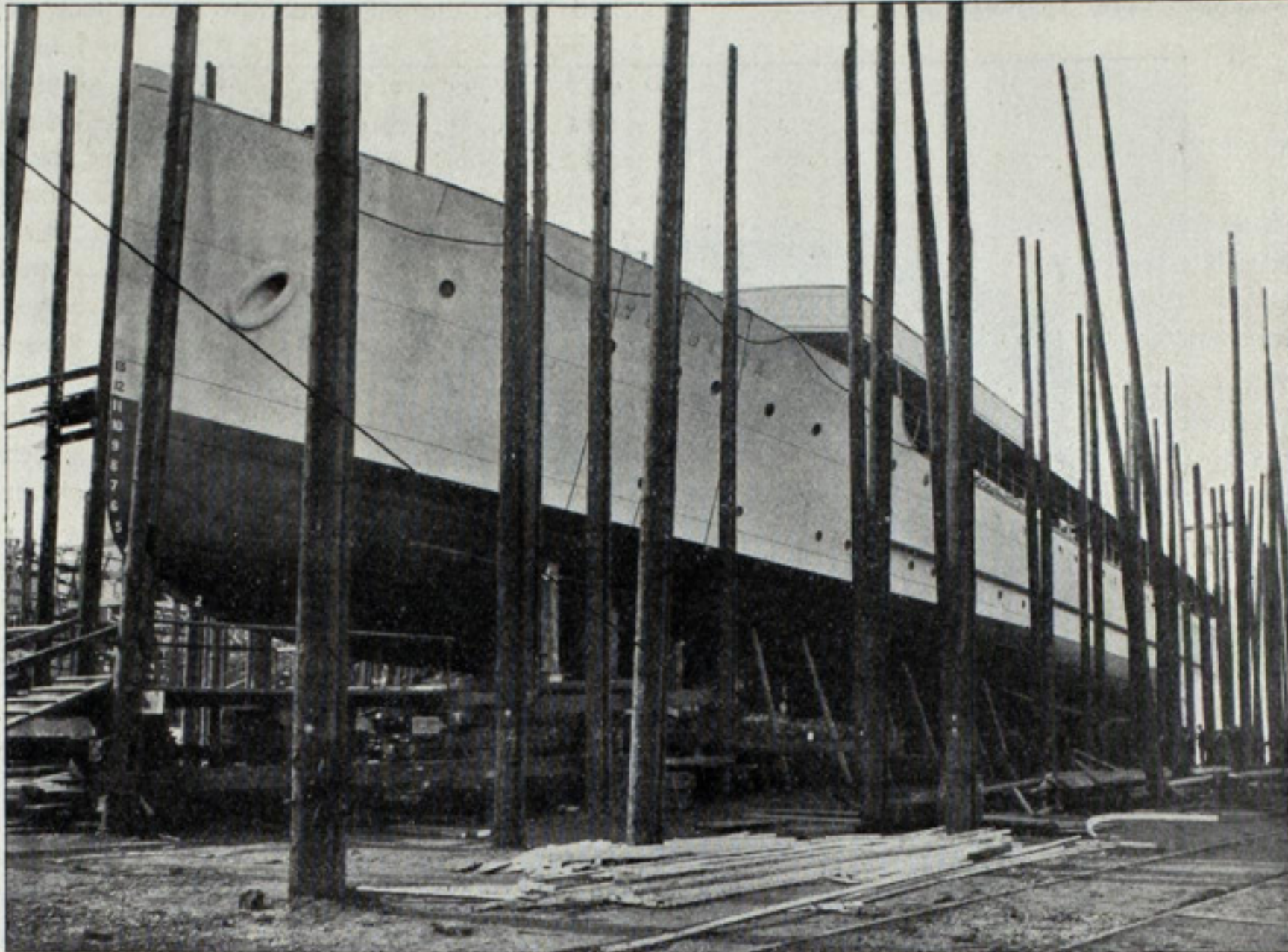
The secretary of commerce and labor has approved certain amendments to the regulations for the inspection of steam vessels that were made by the Board of Supervising Inspectors at their meeting in Washington last January and

they now have the force of law. One of them is that the holder of a license as a first-class pilot may have the same endorsed without examination as master of lake, bay, sound or river steamers of 150 tons or under engaged exclusively in towing. In order to obtain a license to cover a steamer of 150 tons the rules provide for one year's preliminary service on board a barge. As the business of towing is a definite and ex-

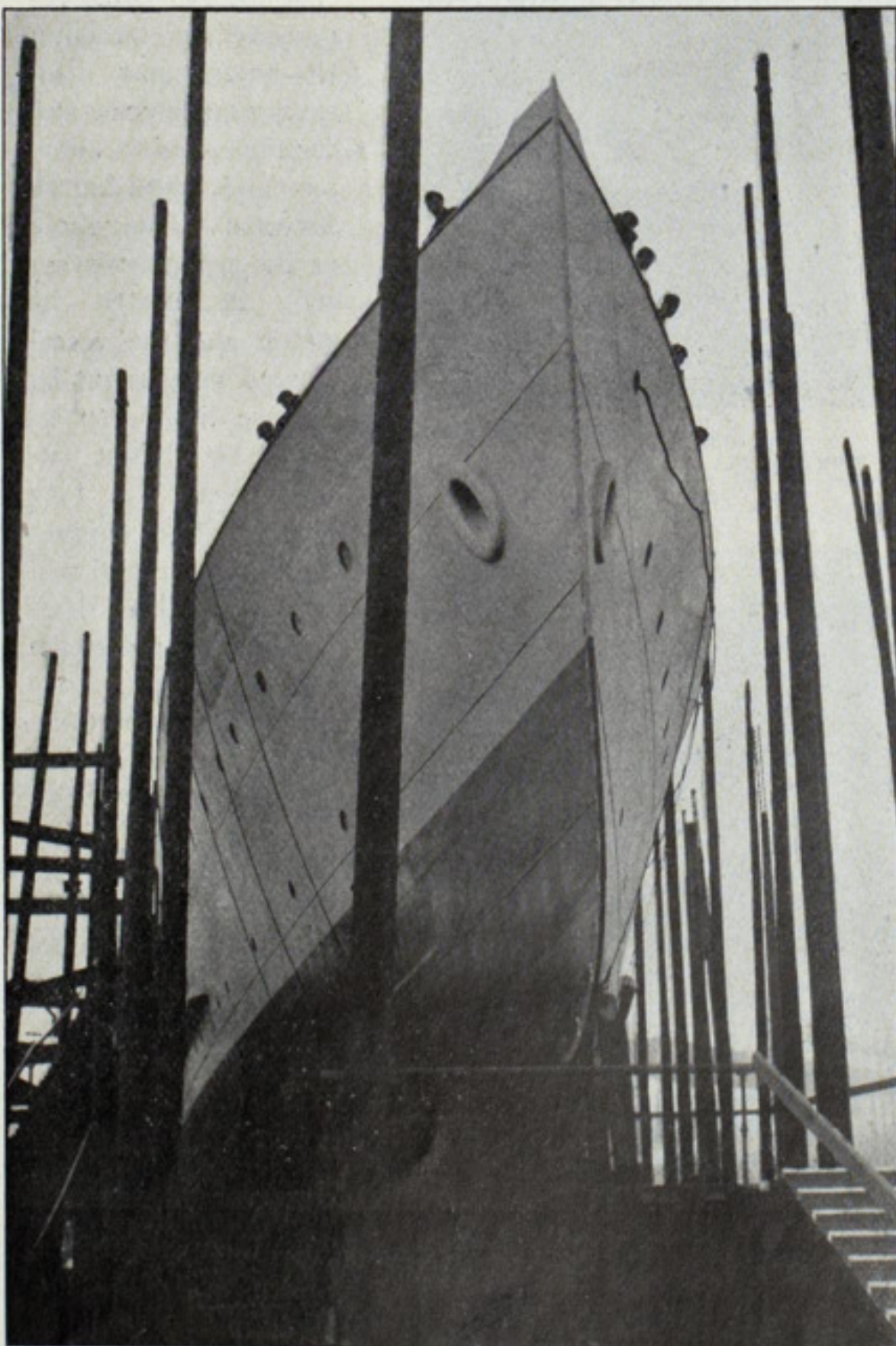
clusive business the inspectors did not think that a man ought to be disbarred from operating a tug over 100 tons because he did not have the preliminary training that the rules require. Tugs are constantly growing in dimensions and the rules were amended to govern tugs up to 150 tons. The following named devices approved by the board have also been approved by the secretary of commerce and labor: Kapoc life-preserver, presented by David Kahnweiler's Sons, New York; Ravenswood life-preserver, presented by C. M. Lane, of the Lane & De Groot Co., Long Island City, N. Y.; cord life-preserver, presented by the Morrison Life Belt Co., St. Louis, Mo. The Engelhardt collapsible (folding) lifeboat, presented by The Engelhardt Collapsible Lifeboat Co., Long Island City, N. Y.; Mayo junior lifeboat, presented by Robert D. Mayo, jr., Hopkins Station, Mich., spring-loaded safety valve, presented by James W. Elwell & Co., New York, N. Y., manufactured by Lethuillier & Pinel, Rouen, France; Hercules spring-loaded safety valve, presented by The N. L. Hayden Mfg. Co., Columbus, O.; Downs fusible-plug stopper, when manufactured of non-corrosive metal, presented by George H. Waters, West New Brighton, N. Y.; Garrity's mechanical straining and filtering apparatus, when manufactured of iron or steel plates stamped and tested the same as required by Rule I for boiler plates, presented by John Garrity, of the Garrity Filter Co., New Orleans, La.

The board, under the authority conferred upon it by section 4429, Revised Statutes, approved coil and pipe boilers presented by the following named persons and firms, when such boilers are constructed in all their parts of wrought iron, steel, or cast steel, in the manner as provided in the general rules of the board:

J. L. Anderson, Seattle, Wash.; Barton's Flash boiler, presented by the Barton Boiler Co., Chicago, Ill.; C. F. Davenport, Brooklyn, N. Y., assigned to Empire State Engineering Co., New York, N. Y.; William F. Duval, Jersey City, N. J.; Keep & Co., Portland, Ore.; Harry Lawson, New York, N. Y.; U. G. Lee, Chicago, Ill.; Locomobile boiler, presented by The Locomobile Co. of America, Chicago, Ill.; James McCartney, Mobile, Ala.; Charles D. Mosher of Mosher Water Tube Boiler Co., New York, N. Y., (types A and B); Pittsburg boiler, presented by Pearson Manufacturing Co., Alle-



TURBINIA ON THE STOCKS JUST PRIOR TO LAUNCHING.



BOW VIEW OF TURBINIA.

gheny, Pa.; Racine water-tube boiler, presented by Racine Boat Manufacturing Co., Muskegon, Mich.; Risdon Iron Works, San Francisco, Cal.; Josiah Robinson, Watervliet, N. Y.; Schwing & Greaud, Gramercy, La.; Horace See, New York, N. Y., improvements in types Nos. 1 and 2; J. A. Shaw, Newark, N. J., and Smith patent boiler, presented by E. J. Codd, Baltimore, Md.

THE STRIKE OF MASTERS OF LAKE VESSELS.

A meeting of the utmost importance will be held in Cleveland today (Thursday) by the Lake Carriers' Association, including the line managers, to determine future action regarding the deadlock which now exists between vessel owners and the Masters' and Pilots' Association. It is expected that every owner from Duluth to Buffalo will be present at the meeting. The situation as it exists today is briefly this: The executive committee of the Lake Carriers' Association, acting on behalf of the association, has made contracts with five labor unions for the season as follows—the Scoopers' Union, the Marine Firemen, Oilers' & Watertenders' Union, the Lake Seamen's Union, the Marine Cooks' & Stewards' Union and the Marine Engineers' Beneficial Association. The only association which the executive committee of the Lake Carriers' Association has met and has been unable to do business with is the Masters' and Pilots' Association. The Masters' and Pilots' Association presented a classification and wage scale of vessels which the executive committee of the Lake Carriers' Association felt that it could not accede to. In addition it was accompanied by demands that were exceedingly unreasonable, the principal one being that a master could not be discharged unless his case was first submitted to an arbitration committee. In the face of this extraordinary demand the master reserved the right to himself to discharge any member of the crew. The absurdity of this latter demand was finally brought home to the advisory board of the association and it was withdrawn so that there remained only the wage scale to be agreed upon. The executive committee of the Lake Carriers' Association explained that business conditions did not warrant an increase in wages, that the operating expenses were at present the highest on record and that there must be an inevitable falling in gross earnings during the present year. The executive committee therefore maintained that instead of an advance there should be a general reduction in wages. The masters and pilots were, however, unwilling to accede to any reduction and a compromise was agreed upon binding the lake carriers to pay last season's rate of wages. The advisory board of the Masters' and Pilots' Association unanimously agreed to this proposition but it appeared that they were not empowered to act for they referred it back to the different harbors for a referendum vote with their recommendations that it be accepted. The various harbors, however, took a different view of this situation and almost unanimously rejected it.

It is clear that the vessel owners did not expect this rejection of the proposition because a number of them, notably the Pittsburg Steamship Co., ordered the masters to report to the vessels. Inasmuch as the advisory board of the Masters' and Pilots' Association had repeatedly stated that it had full authority to act, except on the subject of wages, it was fully expected that the wage question would be the only one acted upon by the harbors. But District Captain Howell held that all negotiations were off and that the masters and pilots stood upon their original demand. He countermanded the order given by Mr. Coulby that the masters of the Pittsburg Steamship Co.'s vessels should report to him.

This original demand is one that the owners declare they cannot possibly accept, holding that to do so would be to surrender the management of the ships altogether. The owners were willing to pay a full season's wages even if the season did not begin until June 15 and ended in October. They

stood pledged to pay \$1,900 for this service, which for that period would work out at about \$400 a month or nearly \$100 a week. No such scale obtains elsewhere in the world and it was this offer that the masters and pilots rejected.

President Livingstone of the Lake Carriers' Association issued a lengthy statement to the press in which he outlined in detail the proposition of the association. District Captain Howell replied to this statement of President Livingstone in which he declared that if all of the owners were of the same temper as Mr. Harry Coulby, president and general manager of the Pittsburg Steamship Co., and Mr. J. H. Sheadle, manager of the Cleveland Cliffs Iron Co.'s fleet of vessels, the masters would have little difficulty in coming to an understanding. The inference was, of course, that Mr. Coulby was not in exact accord with the statement issued by President Livingstone, with the result that Mr. Coulby felt incumbent to announce that he had drawn up the statement with Mr. Livingstone and that it therefore embodied his sentiments. Mr. Sheadle also endorsed it.

The vessel owners have never presented a more solid front than they do today. Not a vessel belonging to the Lake Carriers' Association is stirring; even the line boats which run in conjunction with the great railway systems have cancelled their schedules and are declining freights. They have represented that they are willing to fight this thing out now if it takes the balance of the year. The purely passenger lines, represented by the Detroit & Cleveland and the Cleveland & Buffalo lines, made private agreements with the masters and pilots, owing to the fact that their interests are widely divergent from those of the ordinary bulk carrier, with the result that the executive committee of the Lake Carriers' Association has requested them to return their stock certificates to the association. The railways which operate line boats have sent their package freight by all-rail rather than turn it over to the independent passenger lines. Vessel owners at Chicago, whose boats have held grain all winter, have discharged it into cars, so that it may go east by the all-rail route. The great ore-producing interests, which have millions upon millions of tons to ship, have declared that the issue may as well be fought out now as ever, and this has operated upon the individual vessel owner as a great solidifying force. The owners feel that the strike of the masters is the crucial one, because if the master is not the representative of the owner aboard, then the owner has no representative and his property is floating about in the lake beyond the slightest vestige of any control which can be exercised by him. It looks like a fight to a finish. It is one which will have to be fought out by the masters and mates alone. There is assurance that the other labor organizations will not enter into any sympathetic movement.

In our Scotch correspondence of April 28 it was stated that the Babcock & Wilcox Co., Glasgow, had received orders from the United States for fifty boilers amounting to 50,000 I. H. P. for several battleships and cruisers, building for the United States navy. It appears that this statement has had some currency in Great Britain, but it is untrue. All the Babcock & Wilcox boilers for the United States (over 400,000 H. P.) have been built or are building at the works of the company at Bayonne, N. J. No Babcock & Wilcox boilers have been ordered for the Georgia and Virginia as the correspondence erroneously stated. Babcock & Wilcox Co., Ltd., at London have built at their works in Renfrew-on-the-Clyde some 250,000 H. P. of Babcock & Wilcox boilers for the British navy, but British-built boilers could not be used in American naval vessels because under United States laws material of foreign manufacture cannot be used in such vessels.

The battleship Rhode Island was successfully launched this week from the yard of the Fore River Ship & Engine Co.

COMMERCE OF LAKE SUPERIOR.

**Mile-Ton Report of the Sault Ste. Marie Canal is of Absorbing Interest—
34,674,437 Net Tons of Freight were carried through the Canal
in 1903 and \$26,727,735.17 was paid to Vessels for carrying
it—The Total Value of the Freight was \$358,306,300.**

It has been said frequently in these columns that there is no adequate measure of the port to port commerce of the great lakes, and therefore no way of determining the total commerce of the great chain of waters. However, it is fair to assume that more than half of the commerce of the lakes passes through the canals at Sault Ste. Marie, and it is fortunate indeed that records at this point are very reliably kept by the officials in charge of the United States and Canadian canals. Gen. Supt. Joseph Ripley has just submitted to Maj. W. L. Fisk for transmission to the secretary of war the exhaustive report of canal commerce for 1903 that is known as the mile-ton report. The report shows that \$26,727,735.17 was paid as carrying charges to vessels that moved 34,674,437 net tons of freight through the canals in 1903, and that the total value of the freight was \$358,306,300. The cost per ton per mile of moving this freight was .92 of a mill against .89 of a mill in 1902, against .99 of a mill in 1901 and 1.18 mills in 1900. The high rate in 1900 was influenced by the fact that season contracts for moving a great part of the ore were made at \$1.25 a ton.

The total freight traffic of 34,674,437 net tons for the season of 1903 when compared with the season of 1902, the maximum in the history of the canal, shows a decrease of 4 per cent, or, 1,286,709 tons; but in comparison with the previous maximum year, that of 1901, this year's traffic shows a gain of 6,271,372 tons or 22 per cent. The items showing an increase are coal, grain and salt. The falling off in the movement of iron ore largely accounts for the decrease in the total traffic. The total number of passengers was 55,175, a decrease of 4,702, or 7 per cent. Vessel passages through both canals numbered 18,596, showing a loss of 4,063 passengers or 18 per cent, as compared with the 22,695 passengers in 1902. The total lockages numbered 11,642, showing a loss of 1,204 lockages, or 9 per cent. The season of navigation continued for a period of eight months and fourteen days, during which time the average monthly traffic was 4,095,406 tons.

The traffic through the American canal was 84 per cent of the total freight and 42 per cent of the passengers carried, the amount being 29,172,252 tons of freight and 23,156 passengers. Compared with the season of 1902, there was a decrease of 2,060,543 tons of freight, or 7 per cent, and an increase of 378 passengers, or 2 per cent. The American canal opened April 11 and closed Dec. 15, 1903, making the length of its season 249 days.

The traffic through the Canadian canal was 16 per cent of the total freight and 58 per cent of the passengers carried, the amounts being 5,502,185 tons of freight and 32,019 passengers. Compared with the season of 1902 there was an increase of 773,834 tons, or 16 per cent and a decrease of 4,580 passengers, or 13 per cent. The Canadian canal was opened April 2 and closed Dec. 13, 1903, making the length of its season 256 days.

The growth of Lake Superior commerce during the past half century has been phenomenal. The estimated amount and value of articles which crossed the portage at Sault Ste. Marie in 1851, to and from Lake Superior, was 12,600 net tons, valued at \$1,675,000. In 1861, a decade later, the traffic through the state lock was 88,000 tons, valued at \$6,000,000; in 1871, 585,000 tons, valued at \$13,000,000; in 1881, through the state and Wietzel lock, 1,567,741 net tons, valued at \$30,000,000; in 1891, through the Wietzel lock, 8,887,759 net tons, valued at \$123,178,208; in 1901, through the Weitzel, Poe and Canadian locks, 28,403,065 net tons valued at \$289,906,865. Thus the percentage of increase in tonnage of each year's traffic over that of the preceding year has averaged as follows: 1851-1860, 21 per cent; 1861-1870, 21 per cent; 1871-1880, 10¼ per cent;

1881-1890, 19 per cent; 1891-1900, 12¼ per cent; average 1851-1900, 16⅓ per cent. Following are some of the most interesting conclusions regarding the traffic of 1903:

Total mile-tons.....	28,974,660,408
Total freight carried—tons.....	34,674,437
Total valuation placed on freight carried.....	\$349,405,014
Average value per ton of freight carried.....	\$10.08
Total amount paid for freight transportation....	\$26,727,735.17
Average distance freight was carried—miles....	835.6
Cost per mile per ton—mills.....	.92
Average cost per ton for freight transportation..	\$0.77
Total number of registered vessels using canals.	895
Total number of passages by unregistered crafts carrying freight	361
Time American canal was operated—days.....	249
Time Canadian canal was operated—days.....	256
Total valuation placed on registered vessels....	\$74,637,300
Total number of passengers transported.....	55,175
Freight carried by—	
Registered vessels—tons	34,636,850
Unregistered vessels—tons	37,587
American vessels—per cent.....	94
Canadian vessels—per cent.....	6
Passengers carried by—	
American vessels—per cent.....	35
Canadian vessels—per cent.....	65

COMPARATIVE STATEMENT OF COMMERCE THROUGH BOTH THE
AMERICAN AND CANADIAN CANALS AT SAULT STE. MARIE,
MICHIGAN AND ONTARIO, FOR THE SEASONS OF
1902 AND 1903.

ITEMS	Traffic for 1903		Total Traffic for	
	United States Canal	Canadian Canal	Season 1903	Season 1902
VESSEL PASSAGES:				
Steamers.....	10,138	3,889	14,027	17,069
Sailing.....	3,272	297	3,569	4,368
Unregistered.....	833	167	1,000	1,222
Total.....	14,243	4,353	18,596	22,659
LOCKAGES.....				
Number.....	8,395	3,247	11,642	12,846
Tonnage:				
Registered.....	22,998,864	4,737,580	27,736,444	31,955,582
Freight.....	29,172,252	5,502,185	34,674,437	35,961,146
Passengers.....	23,156	32,019	55,175	59,377
Coal:				
Hard.....	1,033,935	115,070	1,149,005	309,948
Soft.....	4,918,176	870,452	5,788,628	4,502,530
Flour.....	4,319,821	2,773,559	7,093,380	8,910,240
Wheat.....	29,181,901	32,202,651	61,384,552	76,730,965
Grain, other than wheat.....	25,990,232	6,105,414	32,095,646	27,740,822
Manufactured and pig iron:				
Net Tons.....	121,658	71,609	193,267	198,152
Salt.....	313,491	141,391	454,882	443,306
Copper.....	95,859	17,018	112,877	120,612
Iron Ore.....	18,978,425	2,676,473	21,654,898	24,277,555
Lumber.....	957,850	45,342	1,003,192	1,091,471
Silver Ore.....	Net Tons..			1
Building Stone.....	21,300		21,300	38,919
General Merchandise.....	429,121	230,718	695,839	740,100

The number of registered vessels of 400 to 500 ft. in length using the canal in trade to and from Lake Superior was ninety-seven; of 300 to 400 ft., 175; of 200 to 300 ft., 314; of 100 to 200 ft., 227; and of less than 100 ft. in length, eighty-two. The records show that 464 different vessels in a single trip of each carried a total of 2,165,538 net tons. The maximum traffic for a single day was on Aug. 31 when 295,782 tons of freight passed through the canal from 151 vessels, having an aggregate tonnage of 211,426 tons. The minimum traffic was on April 2, when two vessels registering 60 tons passed through the canals carrying no freight. There were no lockages on April 3 and 7. The steamer John W. Gates of the Pittsburg Steamship Co.'s fleet is credited with having moved the largest amount of freight through the canal during the season, 164,763 tons. The record for the preceding year was made by the steamer William Edenborn with a total of 183,270

tons. The steamer Bransford of the Hawgood Transportation Co.'s fleet is credited with the greatest number of mile-tons, 158,843,973. The largest single cargo, 8,914 tons, was carried by the steamer William Edenborn of the Pittsburg Steamship Co.'s fleet. The New York Central's steamer Troy has the greatest number of miles run to her credit, 45,340.

Unregistered American craft carried 11,373 net tons of freight in 232 passages, or an average of 49 43-2,000 tons per passage. Unregistered Canadian craft carried 26,214 net tons of freight in 129 passages, or an average of 203 419-2,000 tons per passage. Of the 18,596 passages for the season, 2,461 were by eighty-four vessels under 100 tons register with an average register of 36 tons. The total freight carried by such craft amounted to 2,083 net tons.

The following table will prove interesting as showing the distribution to other lakes of freight bound eastward from Lake Superior and also the district from which freight bound to Lake Superior originated:

East bound.	Net tons
From Lake Superior ports to—	
Lake Michigan ports.....	3,210,674
Lake Huron ports.....	1,155,377
Lake Erie ports.....	22,212,177
Lake Ontario ports.....	354,010
Total	26,932,238
West bound.	Net tons.
To Lake Superior ports from—	
Lake Michigan ports.....	90,031
Lake Huron ports.....	226,047
Lake Erie ports.....	7,329,727
Lake Ontario ports	96,394
Total	7,742,199

ESTIMATED VALUE OF TOTAL FREIGHT PASSING BOTH AMERICAN AND CANADIAN CANALS AT SAULT STE. MARIE, MICHIGAN AND ONTARIO, FOR THE SEASON OF 1903.

Items	Quantity	Price per unit	Valuation
Coal, Anthracite	Net tons 1,149,005	\$ 5.80	\$ 6,664,229
Coal, Bituminous.....	Net tons 5,788,628	3.15	18,234,178
Flour	Barrels 7,093,380	4.50	31,920,210
Wheat	Bushels 61,384,552	.80	49,107,642
Grain, other than wheat	Bushels 32,095,646	.71	22,787,909
Manufactured Iron	Net tons 167,145	110.00	18,385,950
Pig Iron.....	Net tons 26,122	20.00	522,440
Salt	Barrels 454,882	.70	318,417
Copper (refined and matte) ..	Net tons 112,877	230.00	25,961,710
Iron Ore	Net tons 21,654,898	3.45	74,709,398
Lumber	M. ft. B. M. 1,003,192	18.00	18,057,456
Silver Ore.....	Net tons
Building Stone	Net tons 21,300	12.00	255,600
General Merchandise	Net tons 659,839	125.00	82,479,875
Total			\$349,405,014

AMOUNT PAID FOR CARRYING FREIGHT TRANSPORTED THROUGH BOTH AMERICAN AND CANADIAN CANALS AT SAULT STE. MARIE, MICHIGAN AND ONTARIO, FOR THE SEASON OF 1903.

Articles	Quantity.	Rate per unit	Amount
Coal.....	Net Tons.. 6,937,633	\$0 53	\$3,676,945.49
Flour.....	Barrels.. 7,093,380	.12	851,205.60
Wheat.....	Bushels.. 61,384,552	.016	982,152.83
Grain, other than wheat.....	Bushels.. 32,095,646	.016	513,530.34
Manufactured Iron	Net Tons.. 167,145	2.00	334,290.00
Pig Iron.....	Net Tons.. 26,122	1.50	39,183.00
Salt.....	Barrels.. 454,882	.15	68,232.30
Copper.....	Net Tons.. 112,877	1.43	161,414.11
Iron Ore.....	Net Tons.. 21,654,898	.75	16,241,173.50
Lumber.....	M. ft. B. M. 1,003,192	2 50	2,507,980.00
Silver Ore.....	Net Tons..
Building Stone	Net Tons.. 21,300	1.50	31,950.00
General Merchandise.....	Net Tons.. 659,839	2.00	1,319,678.00
Total.....			\$26,727,735.17

In connection with the foregoing table there is also the following summary of relative values of the different commodities passing through the canals:

	Per Cent.
Coal (anthracite and bituminous).....	7.12
Cereals (wheat, rye, oats, corn, barley, flax and flour)	29.71
Iron (iron ore, manufactured and pig iron).....	26.80
Copper	7.43
Lumber	5.17
All other products	23.77-100

TABLE SHOWING TOTAL FREIGHT, ITS VALUATION, FREIGHT CHARGES, AVERAGE HAUL OR DISTANCE FREIGHT WAS CARRIED, AND RATE PER TON PER MILE, FOR SEASONS 1887 TO 1903.

Year	Total Freight Net Tons	Valuation of Freight	Freight Charges	Average Haul	Freight Charges, per mile-ton	Value of American Craft	Value of Canadian Craft
				Miles	Mills		
1887....	5,494,649	\$79,031,757	\$10,075,153	811.4	2.3	\$17,684,550	\$2,089,400
1888....	6,411,423	82,156,019	7,883,077	806.4	1.5	20,881,100	1,514,300
1889....	7,516,022	83,732,527	8,634,246	790.4	1.5	25,328,600	1,597,600
1890....	9,041,213	102,214,948	9,472,214	797.2	1.3	27,857,700	1,777,800
1891....	8,888,759	128,178,208	9,849,022	820.4	1.35	31,947,300	2,119,500
1892....	11,214,333	135,117,267	12,072,850	822.4	1.31	36,220,100	2,108,700
1893....	10,796,572	145,436,957	9,957,483	831.9	1.1	39,017,400	2,115,700
1894....	13,195,860	143,114,502	10,798,310	821.1	.99	41,124,200	1,959,800
1895....	15,062,580	159,575,129	14,238,758	830.0	1.14	40,858,800	2,037,000
1896....	16,239,061	195,146,842	13,511,615	836.4	.99	43,006,200	2,135,300
1897....	18,982,755	218,235,927	13,220,099	841.3	.83	42,375,700	2,001,400
1898....	21,234,664	233,069,740	14,125,896	842.6	.79	45,199,800	2,491,900
1899....	25,255,810	281,364,750	21,959,707	827.2	1.05	65,000,520	3,369,600
1900....	25,643,073	267,041,959	24,953,314	825.9	1.18	66,116,583	3,618,576
1901....	28,403,065	289,906,865	23,217,974	823.3	.99	57,244,200	3,311,900
1902....	35,961,146	358,306,300	26,566,189	827.4	.89	67,205,000	3,792,400
1903....	34,674,437	349,405,014	26,727,735	835.6	.92	68,252,800	6,884,500

The American canal records show that vessels necessarily spent 19,927 hours and 32 minutes in the canal, or an average of 1 hour, 24 minutes and 8 seconds, which includes the time waiting for lockage and passage through locks and canals, the latter being 13½ miles long. Other delays of canal, which included taking on supplies, waiting for daylight or favorable weather, amounted to 13,588 hours and 47 minutes. Other delays to boats due to operating railway swing bridge, amounted to 2 minutes. Trains were delayed 2 hours and 55 minutes by passing boats, temporarily preventing the close of the bridge.

The American canal post office delivered 146,755 pieces of mail during the season, consisting of 128,996 letters, 5,736 postals, 11,204 newspapers and 839 parcels; also returned 727 pieces to the city post office, after being held thirty days uncalled for, and forwarded 4,846 pieces to new addresses. As compared with the last year this shows a decrease of 15,909 pieces of mail.

SOME HISTORICAL NOTES.

The fall in St. Marys Rapids varies from 16½ to 20½ ft. in a distance of three-fourths of a mile.

The first lock was built on the Canadian side of the river by the Hudson Bay Fur Co. in 1798. It was 38 ft. long, 8 ft. 9 in. wide, with a lift of 9 ft. A tow-path was made along the shore for oxen to pull the batteaux and canoes through the upper part of the rapids. This lock, excepting its timber floor and mitre sills, was destroyed in 1814 by United States troops from Mackinac Island under command of Major Holmes.

The first ship canal, known as the State canal, was built on the American side of the river in 1853 to 1855, some 750,000 acres of land in Michigan having been granted by the United States congress for the construction thereof. The canal was 11-12 miles long, 64 ft. wide at bottom, 100 ft. wide at water surface, and 13 ft. deep. There were two tandem locks of masonry, each 350 by 70 ft., having 11½ ft. on the miter sills and a lift of about 9 ft. each. Chas. T. Harvey was superintendent of construction, and the St. Marys Falls Ship Canal Co. was the contractor. The locks were destroyed in 1888 by excavations for the present Poe lock.

The Weitzel lock, 515 ft. long, 80 ft. wide in chamber, narrowing to 60 ft. at the gates, was built by the United

States in the years 1870 to 1881. The depth of water on the miter sills is 17 ft. when the upper pool is 601.9 ft. and the lower pool 584.4 ft. above mean tide at New York. At the same time the depth of the canal was increased to 16 ft., the mean width to 160 ft.; and the stone slope walls were replaced with timber piers having a vertical face. Gen. Godfrey G. Weitzel was the engineer officer in charge of the district from 1872 to 1882, and Alfred Noble was the assistant engineer in local charge from 1870 to 1882. Boyle & Roach were the principal contractors.

The Canadian canal, $1\frac{1}{8}$ miles long, 150 ft. wide and 22 ft. deep, with lock 900 ft. long, 60 ft. wide, having 22 ft. on the miter sills, was built on the north side of the river between the years 1888 and 1895. Hon. Collingwood Schreiber was chief engineer of Dominion canals, etc.; and W. G. McNeill Thompson was the government engineer in local charge of construction work. Ryan & Haney were the contractors.

The Poe lock, 800 ft. long, 100 ft. wide, and having 22 ft. of water on the sills, was built by the United States in the years 1887 to 1896. Gen. Orlando M. Poe was the engineer officer in charge of the district from 1884 to 1895; and E. S. Wheeler the assistant engineer in local charge of construction work from 1882 to 1897. Hughes Bros. & Bangs were the principal contractors.

The American canal since 1892, has been deepened to 25 ft., and its entrance piers have been extended so that its total length at the falls is now 13.5 miles. Its width is variable, being 500 ft. at the upper entrance, 108 ft. at the canal gate, 270 ft. at the basin above locks, and 1,000 ft. at the lower entrance. Dunbar & Sullivan and James B. Donnelly were the principal contractors.

The canal also practically includes that part of the channel through St. Marys river which has been gradually improved through shoals of sand, clay, boulders, sandstone and limestone rock for a distance of 34 miles, so that for a least width of 300 ft. there is a safe navigable depth of about 19 ft. at present stage of water. Col. G. J. Lydecker was the engineer officer in charge of the district from 1896 to 1902, and Maj. W. H. Bixby from 1902 to 1904. John Hickler & Sons, C. F. & H. T. Dunbar, and Carlin, Stickney & Cram were the principal contractors.

The approximate cost in round numbers of the several improvements, is as follows:

Locks and canal of 1855.....	\$1,000,000
Weitzel lock	1,000,000
Poe lock	3,000,000
Widening and deepening canal	3,000,000
Improving channel through river.....	3,000,000
Canadian lock, canal and approaches	4,000,000

Hydraulic power is used for operating the American locks; a pressure of 115 lbs. per square inch being used for the Weitzel lock machinery and a pressure of 380 lbs. for the Poe lock machinery. Electricity generated by water power is used for operating the Canadian lock.

The Poe lock can be filled or emptied in about 7 minutes, and an up-lockage of a boat 350 ft. long has been made in as short an interval as 11 minutes. The gates can be opened or closed in $2\frac{1}{4}$ minutes; although 3 to 5 minutes are usually taken. The Weitzel lock can be operated in about the same time as the Poe lock. The Canadian lock can be operated in about 9 minutes.

AROUND THE GREAT LAKES.

The Russell Contracting Co. has bought the tug Reta from Frank Jackman of Buffalo for \$1,500.

The schooner Ottawa capsized off Sturgeon Bay canal last week. The crew reached shore in a life boat.

Only one boatload of grain and three cargoes of iron ore

have been transported along the Erie canal so far this season.

Capt. Arthur Slyfield and John Boland of Port Huron have bought the Union Line steamer Eber Ward from H. C. French of Buffalo.

Capt. James F. Bowen of Lorain has been appointed master of the supply steamer Superior at the Sault for the Pittsburg Steamship Co.

In the account of the launch of the Sahara published in last week's paper, it was, of course, a palpable error to make Mr. G. A. Tomlinson of Duluth say that whatever credit there was for the building of the Wolvin was due to W. A. Prime of New York. It was a sorry slip of the type. Mr. Tomlinson, of course, said nothing of the kind.

The steamer Maud, loaded with salt, was sunk last night in St. Clair river opposite Marine City by a collision with the United States steamer Survey. The Maud sank in 20 ft. of water two minutes after she was struck. The crew was rescued without injury. The Survey was not damaged. The Maud is of 98 tons and is owned by Edward Phillips, St. Clair, Mich.

The United States engineer at Detroit opened bids this week amounting to \$1,200,000 for improving, widening and deepening the lower Detroit river from the south end of the Lime Kiln crossing through Bar Point shoal. M. Sullivan of Detroit put in the lowest figure on the Amherstburg reach, and Breymen Brothers, Toledo, on the Bois Blanc Range and Bar Point shoal work.

CONTRACTS FOR CUNARD FLYERS LET.

Liverpool, May 9.—It has been officially announced this week that the Cunard company have placed the contracts for the two fast transatlantic mail steamers which they are to have built under their arrangement with the British government. And it comes as no surprise, after all that has been written on the subject, that one is to be constructed by Messrs. John Brown & Co., Ltd., Clydebank, and the other by Messrs. Swan, Hunter, and Wigham Richardson, Ltd., Newcastle-on-Tyne, the machinery for the latter being supplied by the Wallsend Slipway Co. Both firms named are famous as ship builders, and the latter have recently in the case of the Carpathia afforded the Cunard company ample testimony of their ability to construct ships of the highest class. Certainly there could not be at the head of any ship building and engineering concern more capable men than Mr. G. B. Hunter, Sir William H. White, K. C. B.; Mr. John Tweedie and Mr. G. Denton. It should also be noted that the Clydebank firm are also building other important ships of the Cunard line. As previously stated the new fast steamers will be propelled by turbine engines. Preparations to lay down these huge liners will be commenced without delay, and it is understood that the steamers have already been insured against builder's risks for \$3,000,000 each, or one-half their value when complete. It is not yet officially stated what the dimensions of the new ships will be, but the length is known to be 760 ft. It has not varied during all the investigations of the turbine commission. As to beam, the limits are between 85 ft. and 88 ft. It is also anticipated that a draught of 33 ft. to 34 ft. will be necessary when the vessel is laden and has her coal supply of 1,000 tons per day for the voyage. These dimensions are far in excess of all ships built or contemplated.

The three-masted auxiliary schooner yacht Atlantic is receiving an overhauling at Tebo's Basin, South Brooklyn. She will go into commission about the middle of next week. On her way up from Havana the Atlantic logged 288 knots in one day. She had previously logged 280. On her trip she overtook and passed a fleet that had sailed about seven hours in advance of her and beat a five-master among other big craft.

SHIP BUILDING IN SCOTLAND.

Glasgow, May 5.—The month of April has not been so prolific in new contracts as its immediate predecessors. The new tonnage actually booked in Scotland may be put down at 35,000 tons, but then it may be said that the order for the new turbine Cunarder to be built by John Brown & Co., Ltd., was only finally decided last month. This would give a total of 65,000 tons, but the Cunard contract was partly covered by the 1903 estimates. Among the 35,000 tons I note three cargo tramps of 6,500 tons each, four of from 2,000 to 4,000 tons each, and three or four smaller cargo boats, besides coasters, cutters, dredges, etc. The growing additions to the fleet of tramps is a serious matter for owners to contemplate, yet it would seem there are more orders to be placed when terms can be arranged. With the tramp owner it has now become mostly a matter of finance where and when he places his contracts. It is certainly a matter of mystery where and when he finds remunerative employment for his boats.

The launches in Scotland in April were thirty-four vessels of 39,424 tons, as compared with twenty-nine vessels of 45,630 tons in March and with twenty-one vessels of 37,420 tons in April, 1903. The Clyde proportion last month was twenty-seven vessels and 34,805 tons. For the four months of 1904 now completed the total has been 141,810 tons as compared with 133,670 tons in 1903, 152,660 tons in 1902, 143,590 tons in 1901, and 126,475 tons in 1900. This year's output so far is thus 8,140 tons ahead of last year. The April output included one steamer over 7,000 tons, one between 4,000 and 5,000 tons, three between 2,000 and 3,000 tons, three between 1,000 and 2,000 tons, and the rest under 1,000 tons. There were 3,270 tons for Germany, 2,480 tons for Austria, 1,210 tons for Sweden 1,600 tons for Spain, 460 tons for India, and the rest for English, Scotch and Welsh owners. The largest item was the Port Kingston, of 7,400 tons, built by Alexander Stephen & Sons, for the West India service of the Elder-Dempster line. The total included a turbine steamer, to which I shall refer later in the letter. It also included a four-masted barque of 3,200 tons for German owners. The contracts booked during the four months, as reported, are about 55,000 tons more than the launches during the period, but if we take into account the contracts not reported—and there are always several—the excess may be as much as 70,000 tons. Last year at this time the excess of new contracts over launches was only 1,500 tons.

A new turbine steamer has been launched by William Denny & Brothers, Dumbarton, the Londonderry, for the new Irish channel service of the Midland Railway Co. This boat is 330 ft. in length, 42 ft. in breadth, 18 ft. in depth to upper deck, and 25 ft. 6 in. to promenade deck. She is built of mild steel and is amply subdivided by water-tight compartments. The first-class accommodation is situated amidships, and the third-class between the main and mizzen hatchways, while accommodation is provided for cattle drovers at the after end of the vessel. Above the promenade deck amidships there is a shade deck which forms a promenade for first-class passengers in fine weather and shelters the deck below during rain. The first-class accommodation is in a large deckhouse, and consists of private cabins having one, two, and four berths. On the upper deck there are a number of one, two, and four-berth cabins. The dining saloon is on the deck below, immediately forward of the boiler room. The accommodation for third-class passengers marks a considerable advance on the ordinary channel steamer. The vessel has a balanced rudder of a type similar to that fitted in Denny's other turbine vessels, and is steered by means of a steam tiller controlled from the flying bridge by a telemotor. The vessel is ventilated on the thermotank system, which secures a supply of suitably warmed air driven by electric fans through trunks to all compartments of the vessel. After the launch, Mr. James Denny said the Midland Railway Co.

had acquired on their own account a railway system in the north of Ireland, and about a year ago they came into the market for four new steamers. At first it was intended that the steamers should be fitted with ordinary machinery, but later on it was decided that two should be fitted with turbines, and two with reciprocating engines. The comparative results would be viewed with very great interest by all concerned. They had no reason to doubt that the Londonderry would be successful, because only a few days ago they had been having official trials with the Princess Maud for the Stranraer and Larne route. According to the terms of their contract for that vessel, they had to do 20 knots on a double run between the lights, and this with a restricted air pressure and the use of Scotch coal. The result of the trials was that, instead of 20 knots, they got 20.7. He did not think however, that quite represented what was in the vessel, because on the second part of the run Mr. Henry W. Brock in charge of the machinery, found himself embarrassed from the unusual cause of having too much steam. He had to let some out of the engines to allow them to run faster, with the result that in the second half of the trial, and allowing for the consideration of tide, wind, and sea, the speed of the boat came to nearly 21 knots. Had it been a matter of necessity, they would not have had much difficulty under the trial conditions, of realizing that as the mean speed, because the air pressure they were allowed to have was never even approximately approached. He was satisfied the Londonderry would be an equally successful steamer.

Caird & Co., Greenock, have launched the twin-screw steamer Donegal, for the same service on the new Irish route, which the Midland Railway Co. are opening up between Heysham harbor, in Morecambe bay, and Belfast. She is the last to be launched of the three preparing on the Clyde for this service, and is similar in general dimensions to the others, already described. At the luncheon which followed, Mr. T. P. Caird said that the steamers now building for the company were intended to connect their system with Ireland. The Midland company had already been instrumental in introducing many reforms in railway working, reforms which had been of great advantage to the travelling public. The same policy had actuated their board in building those vessels, which would be fitted with every comfort and luxury, and would be unsurpassed by any channel steamers afloat.

The Royal Naval List, published by Witherby & Co., 326 High Holborn, London, is just out. It is a very thorough-going directory of the personnel of the British navy, and as such occupies a position of importance as the authentic record of naval history. A carefully compiled record of the current history of the British navy from the pen of a well-known naval writer now forms an important feature of the work. In the list of ships will be found recorded the victories of famous ships carefully compiled from official records. There is scarcely any question concerning the British navy that the list does not answer.

The New York Yacht, Launch & Engine Co., Morris Heights, New York, are building the following boats: *Bessica*, 42 ft. over all, for H. Coale, Baltimore, Md.; *Roberta*, 58 ft. long, for W. O. Todd, Providence; *Beth*, 62 ft. over all, for Mr. M. Scott of New York; *Paline J.*, 50 ft. over all, for G. W. Jarchow, New York; *Jean and Virginia*, 63 ft. over all, for P. D. Gwaltney, Norfolk; *Chistle*, 53 ft. over all, for J. Thomson, Hartford, Conn.; *Princess*, 30 ft. over all, for J. A. Smith of New York.

The Dominion government proposes to ask parliament to admit cables for fishing boats free of duty as ship's cables are now.

APPOINTMENTS OF MASTERS AND ENGINEERS.

Ball, J. E., Buffalo: Steamer—P. P. Miller, Capt. Whitney Carr, Engineer Wm. McDougall.

Beyschlag, Charles, St. Clair, Mich.: Steamer—America, Capt. Henry Leisk, Engineer Norton Maugh.

Crosby Transportation Co., Muskegon, Mich.: Steamers—Nyack, Capt. John Huff, Engineer Karl Hallberg; Naomi, Capt. Thos. Trail, Engineer B. J. Hopkins.

Canadian Lake & Ocean Nav. Co., Toronto: Steamers—D. E. Ames, Capt. F. X. LaFrance, Engineer S. Gillespie; H. M. Pellatt, Capt. G. A. Brian, Engineer W. Byers; J. H. Plummer, Capt. G. W. Mackey, Engineer R. Chalmers; Turret Cape, Capt. E. L. Stephen, Engineer W. H. Durham; Turret Chief, Capt. M. McPhee, Engineer L. Morton; Turret Court, Capt. James Black, Engineer C. J. McSorley.

Chesbrough, F. B., Emerson, Mich.: Steamers—Kensington, Capt. Mike Canartney, Engineer Frank Goodwin; Kanawha, Capt. Gust Atkinson, Engineer Chris Howard; Kennebec, Capt. L. C. Roberts, Engineer Emerson Harner; Peshtigo, Capt. W. H. Brooks, Engineer Charles Schoenrock.

Calvin Co., Garden Island, Ont.: Steamers—India, Capt. Chas. Coons, Engineer T. C. Smith; D. D. Calvin, Capt. H. N. Smith, Engineer John Kennedy; Simla, Capt. A. H. Malone, Engineer Robt. Veech. Schooners—Burma, Capt. John Ferguson; Ceylon, Capt. Jos. Achee.

Francombe, J. A., mgr., Hope Trans. Co., Detroit: Steamer—Capt. B. Chamberlain, Engineer J. A. Francombe. Schooner—Ed. McWilliams, Capt. Alex Sharron.

Graham & Morton Transportation Co., Chicago: Steamers—City of Chicago, Capt. A. J. Simons, Engineer Wm. J. McClure; Holland, Capt. W. J. Russel, Engineer Chas. L. Barron; City of Benton Harbor, Capt. John Stewart, Engineer —; Puritan, Capt. W. A. Boswell, Engineer Jas. Stewart; Argo, Capt. Ed. Williams, Engineer Wm. F. Johnson.

Kinsman Transit Co., Cleveland: Steamers—Henry Steinbrenner, Capt. Jos. Lampoh, Engineer C. R. Price; Anna C. Minch, Capt. H. Gunderson, Engineer W. H. Miller.

Loutit, W. H., Grand Haven, Mich.: Steamer—Pentland, Capt. Thos. McCambridge, Engineer C. Ball.

Miller, J. B., Toronto: Steamer—Seguin, Capt. James B. Symes, Engineer H. W. Welch.

McMillan, M. B., Detroit: Steamer—Capt. John Ivers, Engineer R. B. McCabe.

Northwest Transportation Co., Sarnia, Ont.: Steamers—Huron, Capt. R. D. Foote, Engineer Saml. Brisbie; Monarch, Capt. Ed. Robertson, Engineer Thos. Crossley; United Empire, Capt. John McNab, Engineer F. Cleland.

Port Huron & Duluth Steamship Co., Port Huron, Mich.: Steamers—Capt. J. C. McLean, Engineer Geo. H. Bonnert; Russia, Capt. Alex McCowan, Engineer W. Brown.

Potter, Teare & Co., Cleveland: Steamer—Mary A. McGregor, Capt. Henry Brock, Engineer Wm. Griffith.

Pickands, Mather & Co., managers, Cleveland: Steamers—Appmattox, Capt. Hugh Stevenson, Engineer H. A. Woods; Pathfinder, Capt. D. H. Mallory, Engineer C. A. Heisner; Victory, Capt. G. B. Mallory, Engineer Alonzo Arnold. Schooners—Santiago, Capt. Frank Hebner, Sr.; Sagamore, Capt. James D. McPherson; Constitution, Capt. Harry Howard.

Tomlinson, G. A., Duluth: Steamers—Sultana, Capt. Geo. W. McCullagh, Engineer Wm. M. McCarron; Sonoma, Capt. A. H. Reed, Engineer T. H. Welch; Sonora, Capt. J. W. Ehrhart, Engineer Byron Beerman; Sinaloa, Capt. F. A. Fick, Engineer M. J. McAuliffe; Yosemite, Capt. J. H. Driscoll, Engineer Wm. Millington; Saxona, Capt. D. P. Craine, Engineer A. R. Fortier; Sahara, Capt. W. D. Ames, Engineer F. A. Steadley.

Spence Bros., Cleveland: Steamers—H. E. Runnels, Capt.

Geo. M. McLeod, Engineer Tom McLachlin; Aztec, Capt. E. T. Mattison. Schooner—Miztec, Capt. Harry Larsen.

Lake Mich. Car Ferry Trans. Co., Chicago, Ill.: Steamers—S. M. Fischer, Capt. Fred Johnson, Engineer Bert Rasch; J. C. Ames, Capt. W. H. Welch, Engineer J. T. Green. Schooners—Car Ferry No. 1, Capt. A. H. Bohlin; Car Ferry No. 2, Capt. Wm. Chambers.

LAUNCH OF THE MARTIN MULLEN.

The freight steamer Martin Mullen, building for Charles L. Hutchinson of Cleveland and others, was launched from the Cleveland yard of the American Ship Building Co. last Saturday. The steamer is named after Martin Mullen, one of the most popular men associated with the great lakes trade, and was christened by his sister, Miss Mary Mullen. The Mullen represents the latest practice in ship construction on the great lakes. She is 436 ft. over all, 416 ft. keel, 50 ft. beam and 28 ft. depth of hold. Her engines are triple-expansion with cylinders of 22, 35 and 50 in. diameters by 40 in. stroke, supplied with steam from two Scotch boilers, 13 ft. 9 in. by 11 ft. 6 in., fitted with Ellis & Eaves draft and allowed a working pressure of 170 lbs. per square inch. Like the Sahara, she is built on the arch system of construction, that is the arch girder plate is substituted in place of stanchions. These girder plates are fastened athwartship between the hatches to web frames, making a continuous hold uninterrupted by any beams whatever and greatly facilitating the unloading of the vessel by means of clam-shell buckets. She has twenty-three hatches, spaced 12 ft. centers and is a striking example of the willingness of the ship builder to design a vessel that conforms to the most modern development in unloading machinery. The Mullen promises to be one of the most successful freighters on the lakes. She will be commanded by Capt. W. B. Benham. Among those who attended the launch were: Misses Libbie and Cecelia Mullen, Mr. and Mrs. John Mullen, son and daughter of Detroit, Martin Mullen, Robert Mullen, Mr. and Mrs. Charles L. Hutchinson, Mr. and Mrs. W. H. McGean, Mrs. John A. McGean of New York, Mr. and Mrs. E. J. Fleming of Chicago, Mr. and Mrs. Henry Wineman of Detroit, Mr. and Mrs. W. H. Becker, Mr. and Mrs. Charles Meyers, Mr. and Mrs. E. T. Bierce, Mrs. M. Andrews, Miss Collins, Miss Hazleton, Miss Helen Mulcahy, W. C. Mulcahy, W. J. Henley, J. V. Guthrie, A. C. Kidney, Henry Steinbrenner, G. A. Steinbrenner, James C. Wallace, R. C. Wetmore, J. A. Savage of Ashtabula, James P. Walsh, J. J. Buckley, Fred Saal, N. J. Boylan, F. D. Herriman, H. N. Herriman, Oliver Upson, John A. Donaldson and John M. Mulrooney of the Marine Review. Immediately after the launch the out-of-town guests were taken to the Clifton Club for luncheon and later to the Century Club for dinner.

The Mullen was the last of the freighters under contract on the great lakes. The stocks are now bare as far as cargo steamers are concerned. The American Ship Building Co. has a floating dock and some small craft and the Great Lakes Engineering Works has a car ferry for the Michigan Central—and that is all as far as new construction is concerned.

The Canadian Lines, Ltd., with a capital of \$1,000,000, has been incorporated with headquarters at Toronto. The company will operate a vessel business in Canada and to all parts of the world. The incorporators are William Bain, Miller Lash, Richard Richardson and E. W. McNeill, all of Toronto.

Burger Bros. is the name of the new company which has taken over the ship yard of Henry Burger, Jr., of Manitowoc, Wis.

ORE SITUATION AT DULUTH.

Duluth, May 16.—The ore shipping season has begun in spite of the tie up of lake shipping through the masters' and pilots' disagreement with owners. The first ship to load at the head of the lake was on Monday, at the docks of the Great Northern road. Other roads have not received orders for ore yet, but it is expected that the Duluth, Missabe & Northern will be running under its summer schedule by May 20, and the Duluth & Iron Range about the same time. The Duluth, Missabe & Northern will be the most active shipper this year, with probably at least 1,000,000 tons higher totals than any other road. A few mines only are yet forwarding ore to docks, and none of the open pit mines have started their steam shovels in ore. Many of the underground properties have become blocked with ore on account of the lateness of the season, and have been forced either to close down for a few weeks or to lay off one of the shifts. This has been true especially of the largest and most active mines on all ranges. Ore is going to docks at Escanaba, over both roads, to Ashland over the Chicago & Northwestern, to Marquette, in a small way it is true, over the Lake Superior & Ishpeming and Duluth, South Shore & Atlantic. No steps have yet been taken to reopen the line of the Algoma Central to Michipicoten, for the reorganization of the Lake Superior Co. is not far enough along as yet to permit the actual beginning of operations.

The Lake Superior Co., at the Sault, has been negotiating for a large quantity of coke and pig iron from Pennsylvania, and will be in shape to begin the rolling of rails long before it can get its own iron from its Michipicoten mine through its furnaces. These furnaces are practically ready for blowing, and should be able to start as soon as the proper ores are secured. The company will probably enter the market for low-phosphorus ores to mix with their Helen. With a bonus from the government, a duty of \$7.50 per ton, to be placed on foreign steel rails as soon as the rails can be made in Canada, and with a market assured from the Grand Trunk Pacific and other roads by the terms of government subventions, the Sault mill surely ought to be in position to make a large profit.

DISPOSITION OF THE CANADA ATLANTIC.

Duluth, May 16.—The report that the Canadian Northern road has bought, or is negotiating for, the Canada Atlantic, is doubtless correct. This disposition of the Canada Atlantic is natural and expected. The Booth family has been wanting to sell for some time and would have done so a year ago to the Rutland but for the difficulties in which Seward Webb found himself. This connection will give the Canadian Northern a long-desired outlet to Montreal and Quebec, and to the seaboard via the Boston & Maine with its tremendous terminals at Boston, and via the Central Vermont as well. The Canada Atlantic has been strong in Boston and Portland exports. In 1901 this road carried at Duluth 7,500,000 bu. grain and 30,000 tons package freight, but since then export business from the northwest has diminished so that May 1 this year the company withdrew from the head of Lake Superior and now maintains nothing but a theoretic organization here. Mr. Jas. T. Rose, who has for years been its manager here, has retired and returned to the general vessel agency business. His wide acquaintance and thorough knowledge of the business will serve him in excellent part now.

GRAIN SHIPS LYING IN WAIT.

Duluth, May 16.—Interlake navigation was opened at the head of Lake Superior by the arrival, May 12, of the May H. Boyce, for lumber. The first departure was the Huronic, May 14, with a little flour for export. Several of the pack-

age freight lines, which had engine room crews engaged and at work, have laid them off on account of the delay in making a settlement with masters and pilots. There are now loaded on ships in this harbor, awaiting departure, 1,672,000 bu. grain, chiefly wheat, flax and oats. D. M. Clemson, of the Provident fleet, loaded 270,000 bu. wheat, the largest cargo ever taken here, and will leave with it as soon as possible. Receipts of wheat have been a trifle better the past week, but cannot be expected to be large so long as farmers are bullish in opinion and the market continues lower or dull.

SITUATION AT DULUTH.

Duluth, May 16.—One year ago today 183 cargoes of coal had been received at this port since the opening of navigation. These cargoes aggregated 750,000 tons. The docks are pretty well cleaned of coal so that the shortage this year in receipts over last year causes an actual shortage in supplies. The great field of ice outside of the harbor is being buffeted about in the winds and it is slowly disintegrating. Ships, doubtless, can easily navigate it, and shore steamers are operating between Duluth and Port Arthur. There is a good inquiry for grain tonnage, but it is limited to spot ships. Eight vessels in the harbor are laden with grain.

UP-BUILDING OUR MERCHANT MARINE.

Editor Marine Review: I am glad to know our merchant marine has such a stout champion. It must transpire that the people of our country will wake up to the fact that we ought to have a few ships of our own to send through that half a billion dollar canal, which otherwise will float only the craft of other nations, Uncle Sam paying the freight all around.

H. W. HOYT.

Chicago, Ill., May 11.

Editor Marine Review: I have read your editorial in this week's issue of the Review with much pleasure and great profit. Your article deals with a subject which today in my opinion overshadows every other subject before the American people, and I am glad to compliment you on presenting this subject to the American people in the logical and forceful manner in which you do.

Cleveland, May 12.

J. J. SULLIVAN.

OBITUARY.

Fred L. Wells, a well-known vessel owner of Port Huron, died at his home this week.

Capt. Lowell L. Blake, for many years captain of boats plying between Washington and Mt. Vernon, and one of the few surviving "forty-niners" in Washington, died in that city last week.

The death of Capt. Frank Burnett occurred at his home Wednesday, May 11, at Louisiana, Mo. Capt. Burnett was for many years supervising inspector of steam vessels of this district under the administrations in the 80's and 90's. He was about seventy years of age.

Capt. William Shanks, who fell into the hold of the steamer Ravenscraig some weeks ago, died at Lakeside hospital, Chicago, last week, from injuries received at the time. Capt. Shanks was only forty-three years old and had been sailing since boyhood. The interment was in Cleveland.

Navigation at the head of the lakes was opened last week when the steamer Mary H. Boyce arrived from Chicago light. She had to cut her way through the ice a considerable distance. The Boyce is a lumber carrier.

The sandsucker City of Rossford, owned by the Homeguard Sand Co. of Sandusky, sprang a leak near the government dock at Cedar Point last week and went to the bottom.

HADFIELD'S STEEL FOUNDRY AT SHEFFIELD.

Certain members of the Institute of Civil Engineers of Great Britain, including Sir William Henry White, the president, recently inspected Hadfield's Steel Foundry at Sheffield, England, one of the greatest in the world, where they were received by Mr. R. A. Hadfield, chairman and managing director, and other members of the company, including Right Hon. Sir W. Brackenbury, Col. H. Vincent, M. P.; Mr. V. Freeborough, Mr. Alex. M. Jack, directors, and Mr. Dixon, secretary. The visitors included Admiral H. J. May, Gen. Wace, member of the ordnance committee; Col. Hadden, director of artillery; Col. Peace of the ordnance committee; Mr. H. T. de la Bere, director of army contracts; Col. Holden, superintendent of the royal gun factory, Woolwich; Lieut. Col. J. D. Manzanos, military attache to the Spanish embassy; Capt. Diaz, Spanish royal navy commission; Sir Edward Carbutt, vice president of the Institute of Mechanical Engineers; Prof. Arnold and Prof. Ripper of University College, Sheffield; Manager Wolley-Dod, Mr. A. F. Yarrow and J. A. MacDonald, chief engineer of the Midland railway.

The visitors were first conducted to the large machine shop of the works, where a number of projectiles made by the company were exhibited. Many of these had been fired through armor plates; and the efficiency of the "cap" of mild steel, now so largely used, was well illustrated by the specimens. A large 12 in. shell that had gone through a 7 in. nickel-steel plate appeared none the worse for the tremendous ordeal it had gone through, being only very slightly scored or scratched on its sides. A 6 in. shot which had penetrated a 9 in. steel plate also seemed to be in excellent condition. Other capped projectiles which had been fired through plates were also no more than slightly marked, whilst broken fragments of like projectiles that had been put to the test without the cap testified to the advantage of that addition.

The company, which numbered in all about 300, were next taken to the luncheon room. Mr. Hadfield, having on his right Sir William White, presided, and was supported by the other directors of the company. In proposing the toast of "Success to the Institution of Civil Engineers," Mr. Hadfield referred to the important work carried out by members of the institution, of which so many prominent members were present. In replying to the toast, Sir William White spoke of the great assistance engineers of all classes received from the great metallurgical establishments of the country. The labors of such men as Mr. Hadfield made possible the wonderful structures which the ingenuity of the engineers devised. The works of the Hadfield company were such as the country might be proud to own. Mr. Hadfield had worked unremittingly to keep the vast establishment of which he was the chief in the foremost rank amongst the metallurgical works of the world, and he had succeeded in this by the splendid combination of scientific research and practical application with which his name was so justly famous. His discoveries in the effect of alloys of iron were well known, and had resulted in the production of steels of exceptional properties.

After lunch at the works the visitors proceeded to inspect the foundries, machine shops and other departments under the guidance of the chairman and directors and members of the staff. In the course of the inspection a number of tests were made to exhibit the remarkable properties of some of the steel manufactured by this company. Trials were also made at the proof butts, a couple of rounds being fired against a Hadfield cemented plate. A capped projectile went right through the plate without damage, whilst the uncapped projectile was broken up on the face. The late Mr. Robert Hadfield, the father of the present chairman of the company, held opinions that cast steel could be used not only for common shell, but also for armor-piercing shell. This view was opposed to the convictions of the metallurgists and artillery experts of the day; but the government officials, with an open-minded liberal-

ity of opinion—a characteristic for which government officials do not always get credit—encouraged Mr. Hadfield to proceed, and ultimately the result of tests made showed that the Hadfield cast steel projectiles were suitable for perforating wrought iron and compound plates. This was about fifteen or sixteen years ago, and since that time great advances have been made in the manufacture of armor. The compound system—i. e., a wrought iron backing with a steel face—has given place, first to Harveyized plates, and, later, to the armor made by the process of chilling chromium steel on the process first introduced by Krupp of Essen. The greatly superior resisting power of plates of this description naturally set the projectile makers a harder task, and for a time foreign manufacturers held an advantage, their lead being attributed to extensive research guided by superior knowledge in metallurgical science. This was notably the case in regard to the projectiles made by Holzer. Fortunately for the credit of English industry, Mr. R. A. Hadfield, who succeeded to the control of the Hecla works on the death of his father, had developed the scientific and research side of the establishment to a high degree, and was therefore able to offer to our government a projectile which was proved to be equal to the remarkable Holtzer projectiles. In the trials of armor plates resistance to a Hadfield projectile was officially allowed to be equivalent, as a test of merit, to resistance to a Holtzer projectile.

In the meantime the increased area of ship's side that could be covered with the new armor—which naturally could be made thinner without sacrifice of efficiency—led to naval gunners demanding a projectile capable of piercing a certain thickness of armor and yet having an explosive charge sufficient to burst the projectile after penetration. The problem set to the steel makers, therefore, was to produce a shell strong enough not to break up on impact, and yet to have a cavity sufficiently large to take a bursting charge of from 4 per cent to 6 per cent of the total weight. A steel of remarkable and apparently antagonistic qualities was needed. If the metal were too soft it would fail to penetrate the hard cemented face of the armor; if it were too hard it would be brittle and would fly to pieces without piercing the plate. Naturally the chemists, or explosive experts, had a great deal to do in working out the whole problem, but that is a part of the subject upon which we do not now speak. It is sufficient to say that the Hadfield cast steel projectiles combined the two features in a remarkable degree, giving a shell that was able to perforate both the Krupp cemented and non-cemented armor, and which, at the same time, carried a charge sufficient to burst the shell after penetration.

The success of the Hadfield company was the more remarkable, as the suggestion to use cast steel in place of forged steel was looked on as chimerical by the leading metallurgical and artillery experts of the day; and it must be said that this view was fully justified by what was known until Mr. Hadfield produced results which upset all previous notions on the subject. One of the most annoying defects of steel shells is their liability to spontaneous fracture. Projectiles that are to all appearance perfectly sound, and which, from the nature and thickness of the metal should have enormous strength, will break up with a loud report for no apparent reason. The cause for this self destruction—which may take place when the shell has been made a considerable time—is traceable to internal strains set up in the metal by unequal contraction during cooling. Sometimes a shell will last, in apparently perfect condition, until it is fired, but will break up in the gun under the shock of discharge. It was held, and the conclusion was fully warranted by what was formerly known, that cast shells would be especially liable to this defect. The contrary was, however, found to be the case in this particular instance, and experience has proved that the cast shells supplied by the Hadfield company are free from the suicidal tendency amongst projectiles. We are assured that though the larger part of

the total number of shells supplied to the navy are made by the Hadfield company, and though many thousands of proof and other rounds have been fired, yet not a single case of spontaneous fracture has been reported from the smallest calibres up to the big 13.5 in. shell. The royal navy has thus been supplied with a shell which is at once cheaper and superior to the class of projectile formerly in use.

Owing to the introduction of Krupp cemented armor of improved description it has been found necessary to introduce a new type of projectile having a somewhat smaller bursting charge than of the armor-piercing shell to which reference has been made; the charge of the later shell being from about $2\frac{1}{2}$ per cent to 3 per cent of the total weight. To meet this demand the Hadfield company have produced what is known as the "Heclon" shell. In testing at their own proof-butts the company have succeeded in sending these shells through plates of a thickness equal to the calibre of the projectile, the latter being in a condition to burst after penetrating the plate. Even better results have been obtained at Shoeburyness, a "Heclon" 6 in. capped projectile having perforated 7 in. of Krupp cemented armor, the shell being recovered in the rear of the plate in a condition for bursting. More recently a further trial of the Hadfield projectile took place before Lord Roberts, when a 12 in. armor-piercing shell, weighing 850 lbs., was successfully fired against a Krupp 9 in. non-cemented plate inclined to an angle of 30° . The velocity was 1,911 foot-seconds and the striking energy 21,500 foot-tons. This projectile was taken by the government officials at random from a lot of 400, and if it had failed it would have meant the rejection of the whole order to the value of many thousands of pounds. The fact gives an idea of how much depends on the success of a single round and the large amount the manufacturer stands to lose in the case of failure of any one projectile. The country may rest assured that under such stringent conditions the manufacturers of projectiles will spare no pains to render every unit absolutely trustworthy.

The Hadfield company have given attention to means of defense as well as to attack. They have quite recently produced a shield for the protection of gun mountings which has been found to possess somewhat unusual qualities. It is, like the projectiles, of cast steel, the metal being a special description to which the name of "Era" steel has been given. One of these shields, 6 in. in thickness, was recently attacked by a 4.7 in. armor-piercing shell, fired at a velocity of about 2,100 foot-seconds, and it successfully resisted the projectile. A 6 in. common shell was next fired at the same plate with a velocity of 2,035 foot-seconds, the striking energy being about 2,875 foot-tons. This merely made a slight indentation about an inch deep. A lyddite shell of the same calibre, and with the same velocity and striking energy, was next fired at the shield, the result being similar to that of the last mentioned round. Finally the plate was attacked by a 6 in. armor-piercing shell, fired with a velocity of 2,039 foot-seconds and having 2,800 foot-tons striking energy. This effected perforation, though it is believed that the projectile burst on the outside of the plate. Mr. Hadfield states that the "Era" cast steel plate can be yet further improved, but as it stands it is superior to the ordinary forged steel, such as is now used for gun shields, as the latter would have been perforated under any of the above tests. A Krupp cemented $4\frac{1}{2}$ in. plate, which, of course, was forged, broke up under similar tests to those above given. The difference in thickness of the shield and plate must, however, not be overlooked.

These results, especially those obtained with projectiles, possess great interest for both civil and military engineers. It has long been held that to produce trustworthy steel articles it is necessary to put mechanical work on the metal, that is to say, that it should be forged either under the hammer, in the hydraulic press, or by rolling. To attempt to produce steel structures that would stand the enormous stresses that the

Hadfield projectiles and gun shield have undergone simply by casting would formerly have appeared the height of folly to the orthodox metallurgist or engineer, although there have been a few who have held more sanguine views in regard to the possibilities of the material. It would, of course, be extremely interesting if we could give the means by which the Hadfield company have achieved these results, but this we are unable to do. The money that is sometimes spent—first in laboratory research, and afterwards in experiment on full scale—represent very large sums indeed, many thousands of pounds often being devoted to the working out of a single detail, or perhaps simply to arrive at a negative result. In the conduct of all industries depending on the scientific application of natural laws the feature is rapidly becoming more and more serious as time passes and the processes of manufacture increase in complexity. One can understand, therefore, that the directors of manufacturing establishments, having spent large sums upon gathering knowledge, look on data thus acquired as one of the assets of the business, and feel they are no more entitled to make such knowledge public than they would be to give away any part of the plant or machinery of the company. It must therefore suffice to say that the success of the Hadfield cast steel is the result of chemical research into the action of often minute differences in proportions of alloys of iron and of the subsequent special heat treatment the material receives. In both these fields of research Mr. Hadfield has spent much time and labor, as the numerous contributions he has made to various scientific and technical societies bear evidence.

Abroad manufacturers have been quick to recognize the need for a fully staffed and equipped research department, and the amounts expended annually for this purpose in some foreign works appear almost incredible. It is only by enterprise of this nature, however, that manufacturers can keep in the van of progress, and, properly directed, this so-called "non-productive" expenditure brings a rich reward. In Great Britain we have been somewhat apt to relegate research work to the laboratories of professors, the manufacturers devoting themselves to what are styled "practical results." This divorce of practice and theory does not lead to industrial success; and we cannot do better in support of this view than quote from a speech of Sir William White's made at a recent meeting of a technical institution:

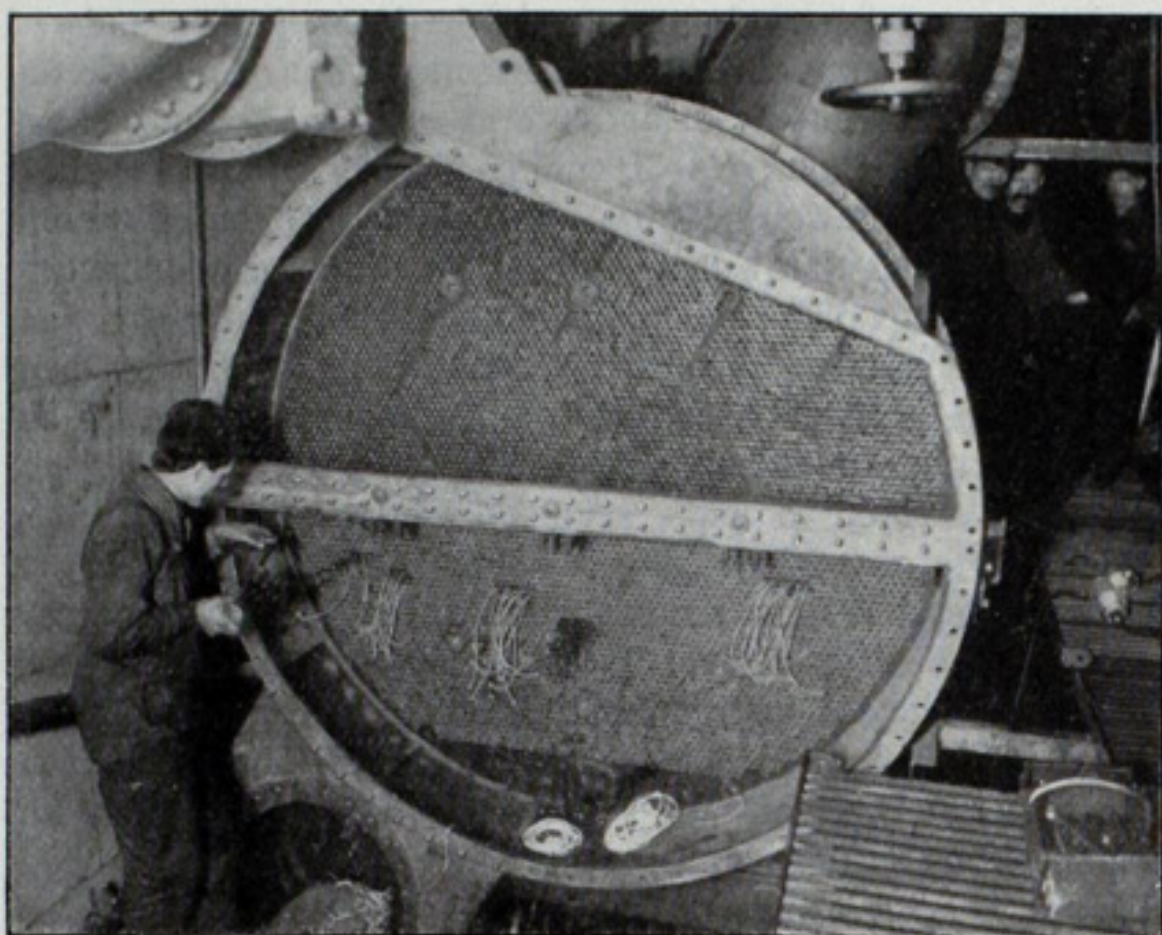
"I do not think it is a wholesome thing to suppose that all research work should be conducted in laboratories separate from works. I have the greatest respect for work done by engineers like Professor Arnold and Mr. Stead in private laboratories, but I hope to see the time when the example of Mr. Hadfield will be more widely followed in this country and when inquiries, both scientific and practical, will be carried out on a very large scale in the works of manufacturers all over the country."

The visitors to the Hecla works were shown other things besides artillery experiments and projectiles, steel castings and forgings of nearly all types being produced. Among these the most prominent were the castings for tramway and railway work, both for permanent way and rolling stock. The "Era" manganese steel, the discovery of which was due to Mr. Hadfield, and was the outcome of a long series of laboratory research extending over some years, lends itself especially well to such "track" work as points and crossings. Manganese steel stands alone in regard to being both hard and tough, so that it has very great resistance to wear, or attrition, and at the same time is not brittle, as ordinary hard carbon steel is. The advantage thus offered for railway or tramway points and crossings, which are subject to both abrasion and shock to a high degree, will be at once apparent. Unfortunately the hardness of manganese steel prevents its being machined, as no steel tool will cut it, and it can only be used as cast.

The works of the Hadfield company cover in all 80 acres.

THE STAR CONDENSER PACKING TOOL.

Mr. J. H. Schlosser of Philadelphia has invented and perfected a simple little tool which, wherever used, has completely revolutionized the old laborious methods of packing the tube ends of surface condensers and which effects a saving in time of from 50 to 60 per cent over hand work or any other tool. Another great advantage derived by the use of the "Star" tool is the possibility of using a much smaller amount and a



STAR CONDENSER PACKING TOOL.

considerably larger size of corset lacing. Condensers packed with the "Star" tool have in every case been absolutely tight and in one instance a pressure of 5 ft. head was successfully placed on a condenser thus packed without developing any leaks. This tool is fitted so that it may be used in connection with an ordinary breast drill, carpenter's brace, or with a small pneumatic drill and when desired can be equipped with a small hand wheel for working in close quarters. A record has been established of packing 1,200 ends in $5\frac{1}{2}$ hours with the "Star" tool, and this has been approached very closely by men using the tool for the first time. All machinists and engineers who have adopted this device are enthusiastic over its merits and speak very highly of the work performed. Mr. Schlosser has placed his invention in the hands of Matteson & Drake of Philadelphia, who have the sole manufacturing and sales rights. Agents are being appointed in various seaports to facilitate the introduction and distribution of the tools.

The Star is manufactured for $\frac{5}{8}$ - $\frac{3}{4}$ in. and $\frac{7}{8}$ in. tubes and a stock is kept on hand for immediate delivery to any part of the country.

CANADIAN SHIPPING NOTES.

The steamer Lulla of the Toronto Ferry Co.'s fleet was damaged by fire at her dock, May 10.

There have been constructed during the winter at Edmonton, Ont., ten scows for the Saskatchewan river trade, from Battleford, Sask.

H. Calderwood, manager of the Collingwood Shipbuilding Co. was married at Boston, Mass., May 7, to Miss J. A. Harrison of Toronto.

The steamer Ojibwa will be placed on the run from Toronto to Oakville this year. The Ojibwa was formerly named the A. J. Tymon.

The proposed subsidised steamship service between Mexico and Canada will probably be operated between Mauzaulls and Vancouver, B. C.

The section of the Trent Valley canal between Lakefield and Peterboro, Ont., which includes the hydraulic lift locks, will be opened for traffic June 1.

The steamer Cariboo has been launched from Milton's ship yard, Goderich, Ont., for the Dominion Fish Co. The steamer is 150 ft. long and 28 ft. beam.

The Buffalo tug Michael Davitt struck a sunken pile at the entrance to Welland river, Ont., and sunk in 15 ft. of water. Her bottom is reported badly damaged.

A deputation of shipping men has asked the Dominion government to provide a dry dock at Montreal, on a site between the Mackay Guard pier and Windmill point.

The Canadian Pacific railway is changing the propellers on its upper lake steamers. The old propellers had a pitch of 18 ft., and these are being replaced by screws of 21 ft.

The Canadian Pacific railway officials deny that its Pacific steamships Tartar and Athenian have been sold to the Japanese government, and also that it has purchased additional vessels for its Atlantic fleet.

The Dominion government has extended until May, 1905, the contract with the Canadian-Australian line of steamers running between Vancouver and Australian ports. The cash subsidy for the service is \$175,000.

A new steamship service has been inaugurated between Charlestown, Pr. I., and the western ports of Cape Breton island as far as Sydney and North Sydney. The service is being performed by the Lunenburg.

The Midland Towing & Wrecking Co. of Midland, Ont., is suing the British America and the Western Assurance companies for \$3,500 each on account of the insurance of the tug Reliance, burned at Owen Sound in 1903.

The Canadian Pacific railway steamer Princess Victoria, recently made the trip from Seattle, Wash., to Victoria, B. C., 69 knots, at the rate of 20.2 knots an hour, and for 30 knots of the distance her speed was 21.1 knots.

F. B. Polson and J. B. Miller of the Polson Iron Works, Toronto, have been visiting ship yards in Great Britain with a view of obtaining information for use in laying out the additional yard space secured for the works at Toronto.

Arrangements are being made by the department of marine for the use of an ice breaking steamer on the St. Lawrence in the spring to break up the ice, thus rendering the opening for navigation earlier and preventing danger from floods.

R. F. Armstrong, city ticket agent Intercolonial railway, Halifax, N. S., who died there May 5, was one of the officers on the confederate cruiser Alabama and took part in the engagement with the United States steamer Kearsage off Cherbourg, France, June, 1864.

The Richmond Steamship Co.'s steamer Segu has been put on a route between Marble Mountain and Mulgrave and Marble Mountain and Grand Narrows, N. S., calling at intermediate points. Bi-weekly trips will be made on the first route and four trips a week on the second.

The tender of P. Lyall & Sons of Montreal has been accepted by the Montreal harbor commission for the construction of steel sheds on the wharf. The contract price of the work is \$2,305,000. For providing an elevated roadway to the second story of the sheds the tender of McClintock & Marshall of New York, for \$259,000, was accepted.

The Canadian Pacific railway is considering the question of constructing large wharves at St. John, N. B., for its own use. Wharves for ocean going vessels are greatly needed during the winter, and the city officials do not want to spend any more money on the port, while local jealousies are sufficiently strong to prevent grants being obtained from parliament to make the additions required.

The steamer Oriole, of the Muskoka Lakes Navigation & Hotel Co., capsized while rounding a corner in the Muskoka river near Bracebridge, Ont., and the 150 passengers had some narrow escapes. The accident is stated to have been brought about through the steamer having been rendered top heavy by the method of loading ore cargo, and the number of passengers and extra swift current in the river.

WANTED and FOR SALE Department.

FOR SALE.

Steamer for Sale at Cost, \$13,500.

The old Anchor Line twin-screw steamer Gordon Campbell. Two decks, gangways, hoisting machinery, etc. Suited to carrying coal, lumber, ties, package freight, etc. Spent \$3,500 in repairs this year. Other business requires my undivided attention and I will sell for cost to me. W. F. Carroll, 1011 Ashland block, Chicago. tf

Freight and Passenger Steamer.

For Sale.—Up-to-date, complete, speedy excursion freight and passenger steamer. Accommodate 400 to 500. Address Indiana Trans. Co., 2 Rush St., Chicago. May 19

Steamer for Sale.

WOOD HULL PROPELLER CITY OF GRAND RAPIDS.

Length 125 ft., beam 26 ft., depth 9 ft. Average speed twelve miles. Rated A-2. State rooms. Licensed for 92 cabin, 651 excursionists. Strong and staunch for freight. A great rough weather boat. In first-class condition. \$4,000 repairs in 1903. Will be sold at a bargain. Address

D. F. TOOMEY,

May 26

DUNKIRK, N. Y.

FOR SALE.

Launch Flora for Sale.

For Sale—The handsome gasoline cruising launch Flora. Length, 36 ft.; standing top and cabin; cherry finish; electric lights; a 25-H. P. 4-cylinder Leighton engine; outfit as good as new; speedy; seaworthy and comfortable; at a decided bargain. Edward Oswald, Syracuse, N. Y. May 19

Yacht for Sale.

New beautiful 100-ft. steam yacht, fully equipped. Owner physically unable to use yacht. Will sell for any reasonable offer. Yacht can be seen in Detroit. Address M. J. Steffens, 57 East Twenty-second st., Chicago. tf

Lighter for Sale Cheap.

Lighter three years old; three gunnels, 6 in. thick; three iron arches, full length inside; 92 ft. long; 24 ft. beam; 7 ft. deep amidships. Has fully 2 ft. rise at each end. Can be seen at Lorain, O. Inquire of J. J. Stang, Lorain, O. May 12

Steamer C. W. Liken.

For Sale Cheap.—79 ft. long over all, 18 ft. beam. Engine 10 square. Rebuilt this winter. Would make good fish tug or small passenger tug. For further particulars address A. Wheeler, Bay City, Mich. May 19

FOR SALE.

Steam Barge For Sale.

500-ton steam barge at low price. Address E. B. Johnson, Chaumont, N. Y. May 19

WANTED.

Mud Scows Wanted.

Wanted—Two mud scows, capacity one to two hundred cubic yards. State price and particulars. Address Box 65, Marine Review, Cleveland. May 26

For Results

Use the Wanted and For Sale columns of the Review, if you want to buy or sell second-hand vessel property or marine machinery.

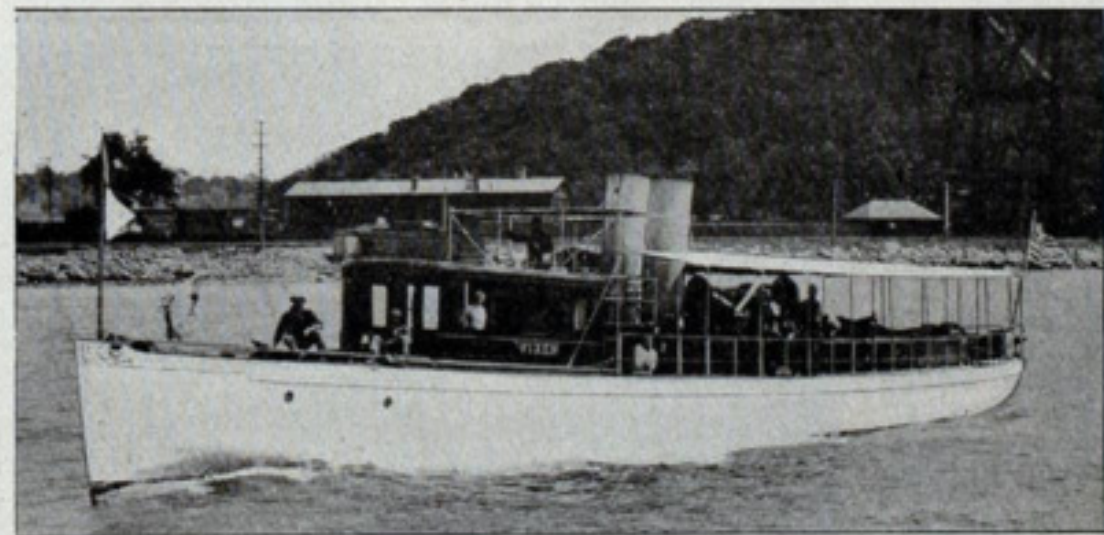
Sealed proposals will be received at the office of the Lighthouse Engineer, Milwaukee, Wisconsin, until 3 o'clock p. m. June 1, 1904, and then opened, for a foundation crib and concrete pier with light tower and dwelling for Racine Reef, Lake Michigan, Wisconsin, in accordance with specifications, copies of which, with blank proposals and other information, may be had upon application to J. G. WARREN, Major, Corps of Engineers, U. S. A., Engineer. May 19

PROPOSALS FOR DREDGE.—Mississippi River Commission, Fullerton Building, St. Louis, Mo., May 17, 1904.—Sealed proposals, in triplicate, for construction and delivery of self-propelling hydraulic dredge and ponton pipe line will be received here until 12 noon, standard time, June 25, 1904, and then publicly opened. Information furnished on application. WM. B. LADUE, Capt., Eng'rs, Sec'y. June 23



Steam Yacht Catherine.

FOR SALE—Length 78 ft., beam 18 ft., triple expansion engines, water tube boiler, allowed 200 lbs.; electric light, search light, mahogany deck house 9 by 16, power launch, complete outfit, all in first-class condition. One of the best family cruising yachts on the Lakes. Inquire Wickes Bros., Saginaw, Mich. June 9



FOR SALE—High speed yacht, formerly named Vixen; speed of twenty miles per hour guaranteed. Address Gas Engine & Power Co. and Chas. L. Seabury & Co., Consolidated, 11 Broadway and Morris Heights, New York City. June 2

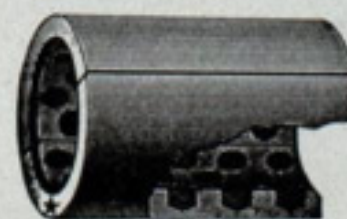
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These Blocks Save the Rope and Outwear all others. Send for 1902 Catalogue M. A. R. FREE.

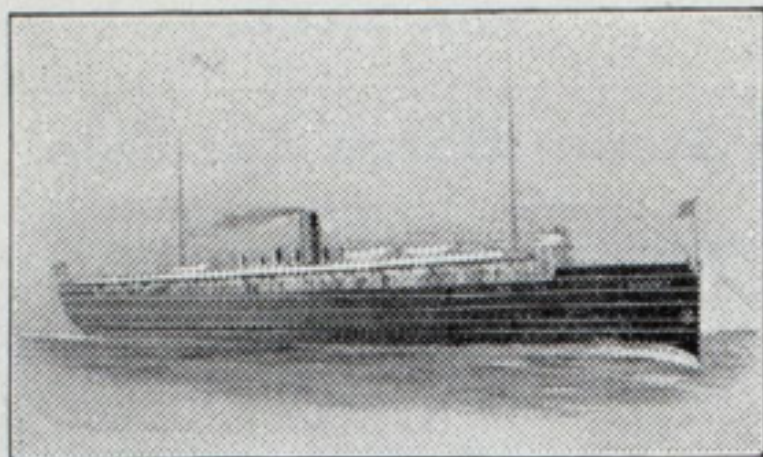
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Cars leave Niagara Falls, N. Y.,

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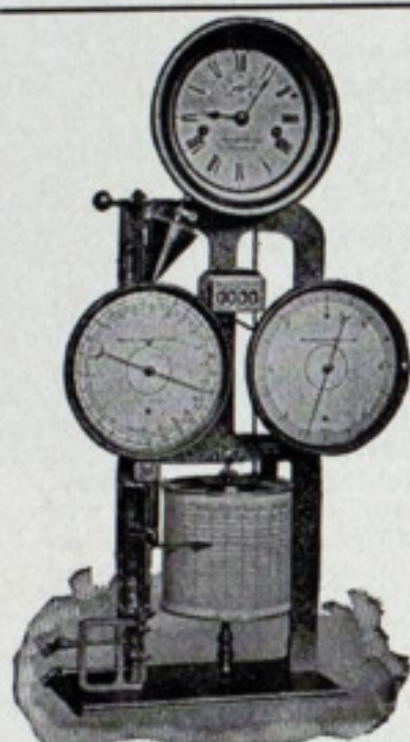
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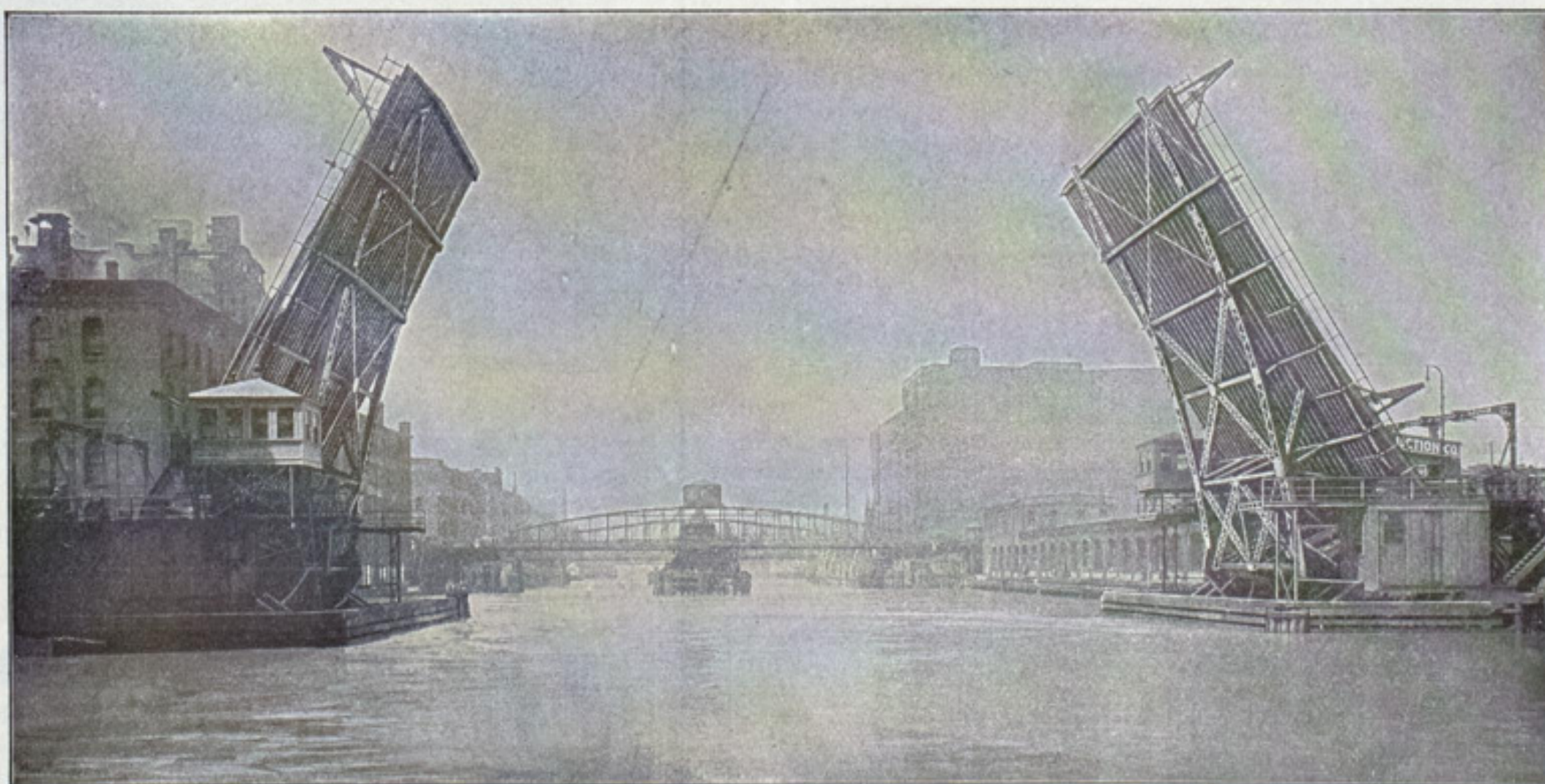
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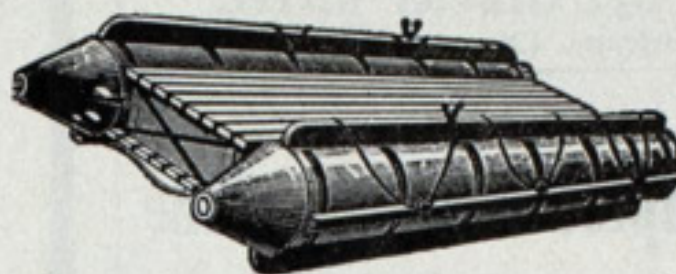
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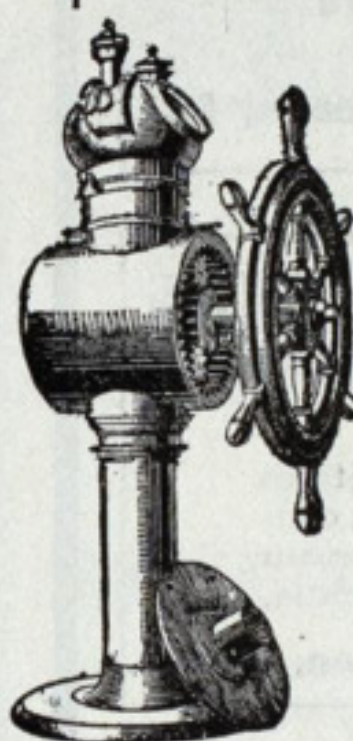


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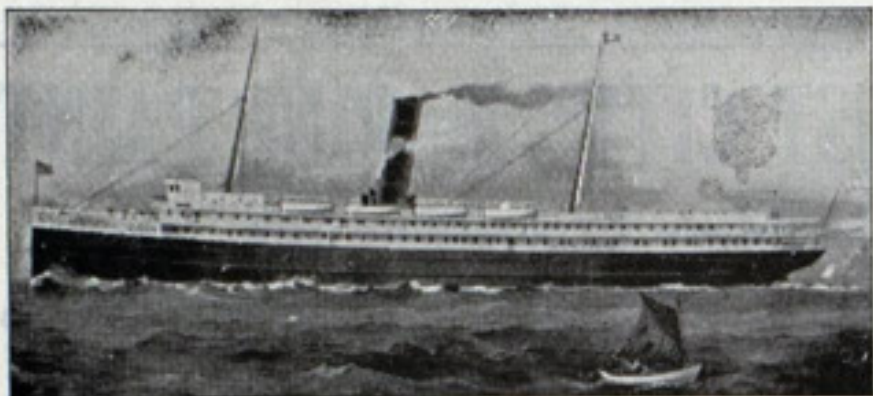
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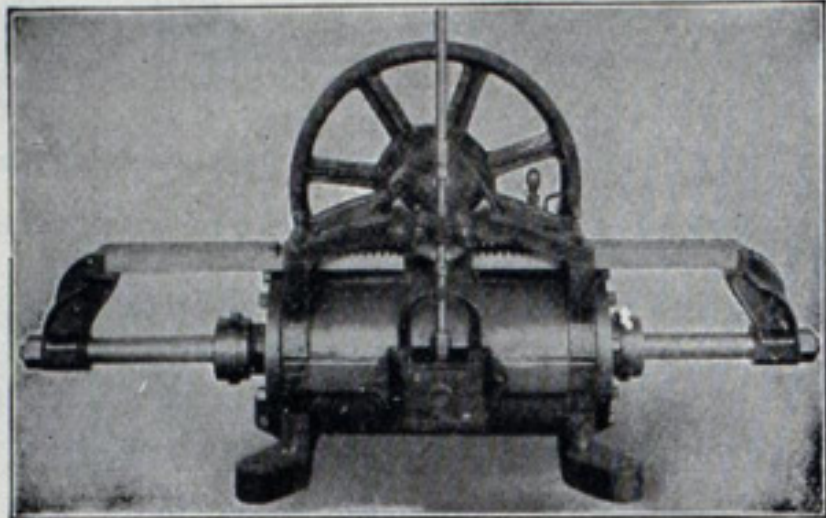
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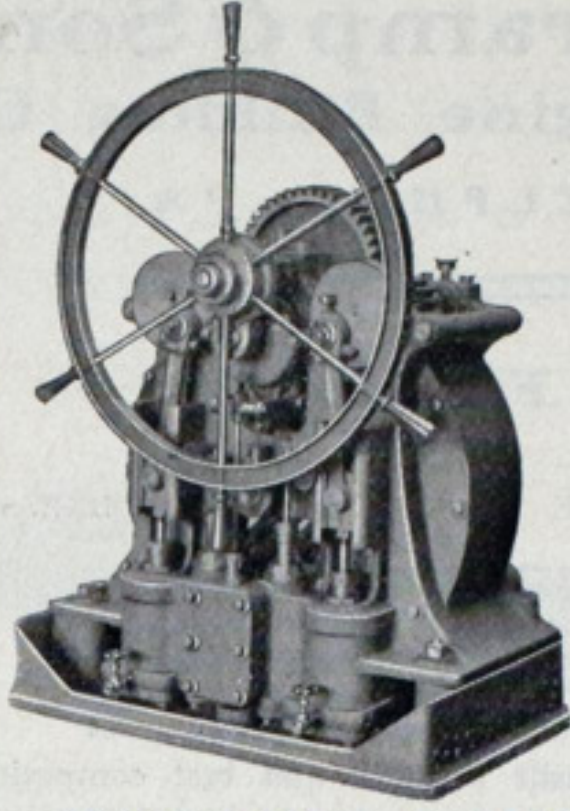
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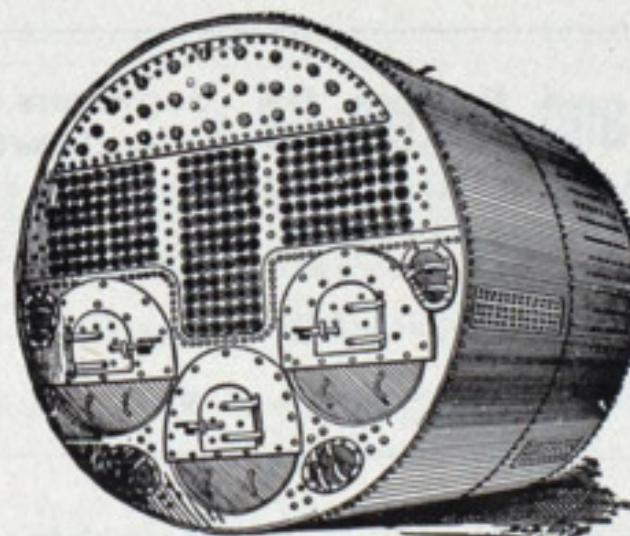
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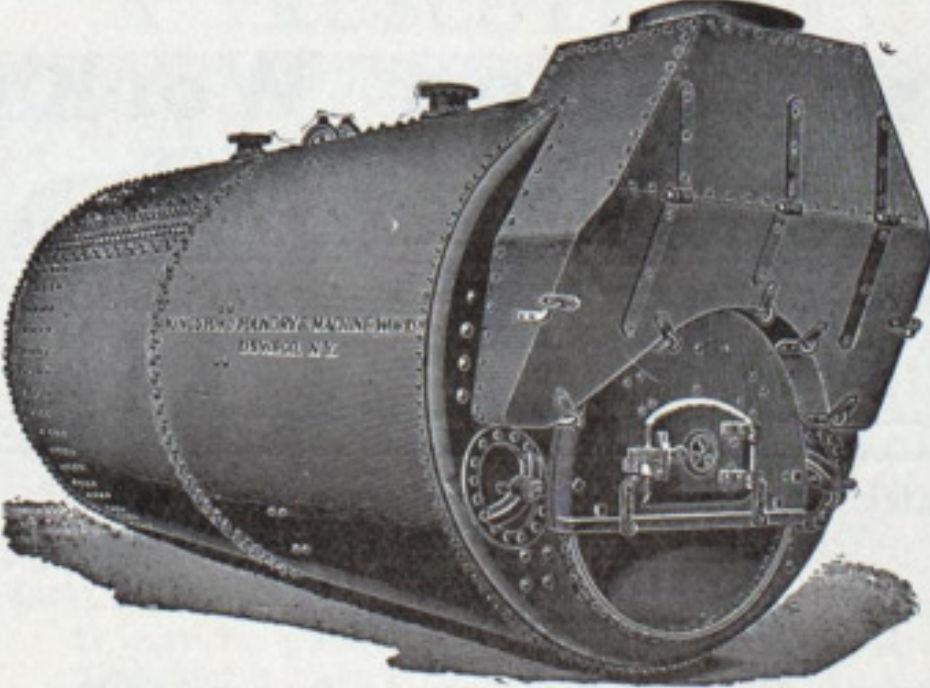
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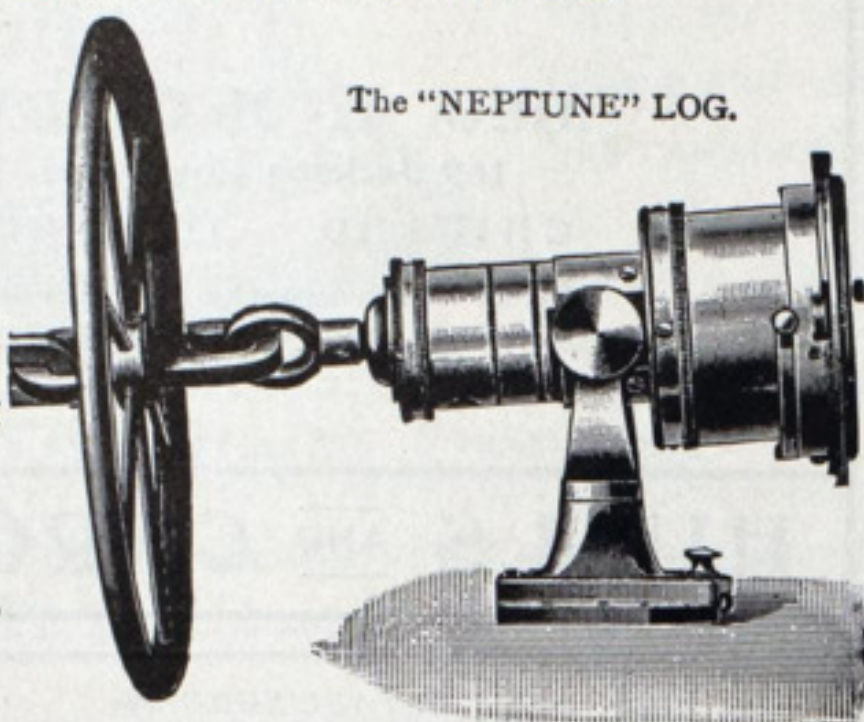
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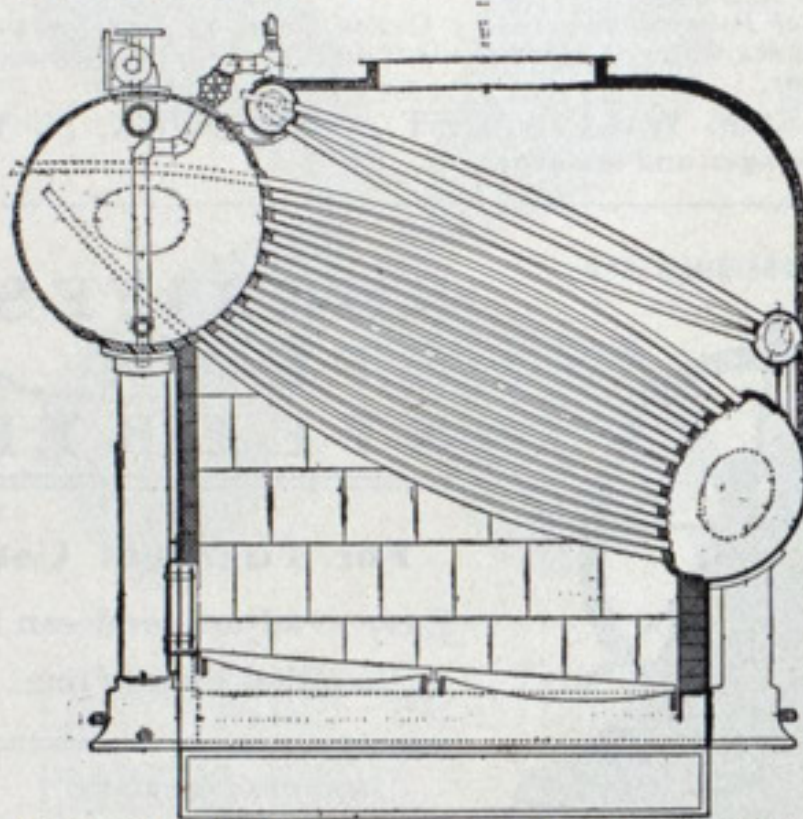
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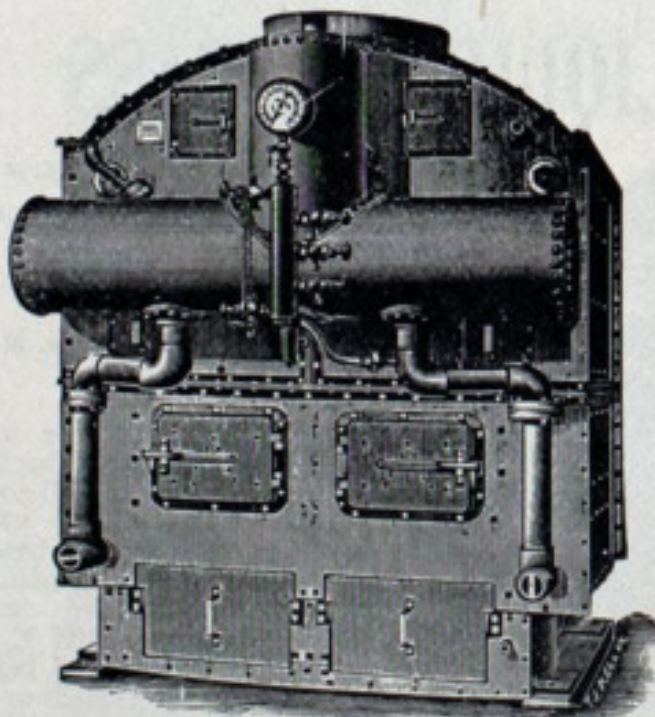


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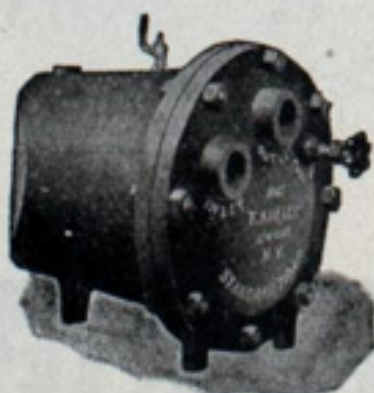
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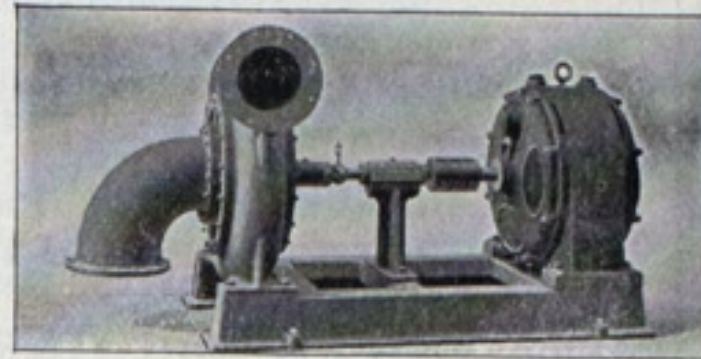
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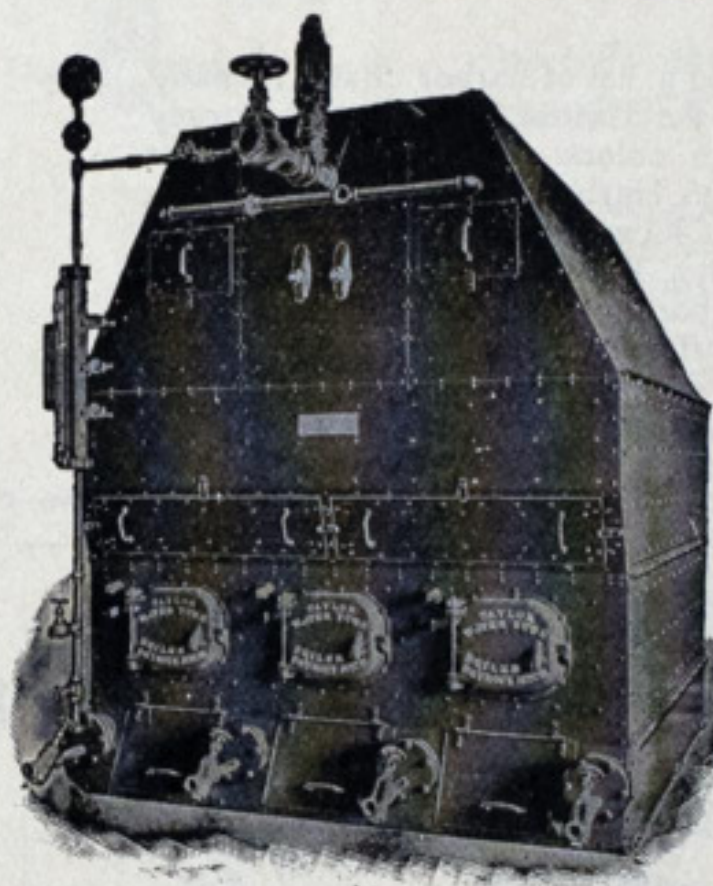
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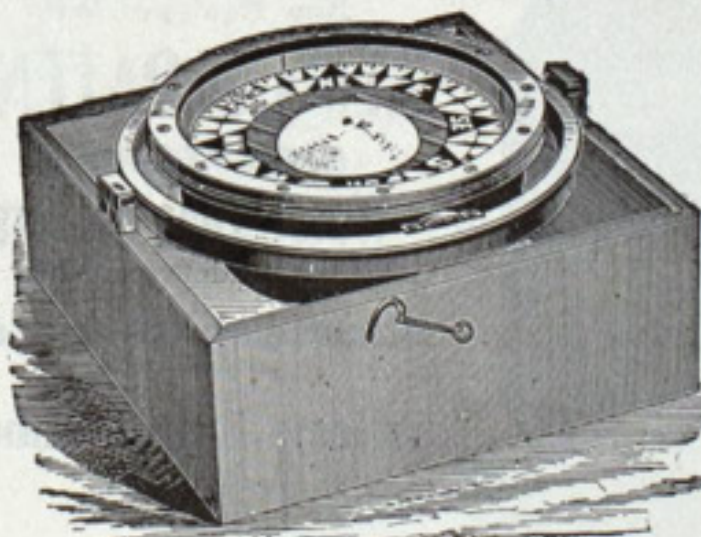
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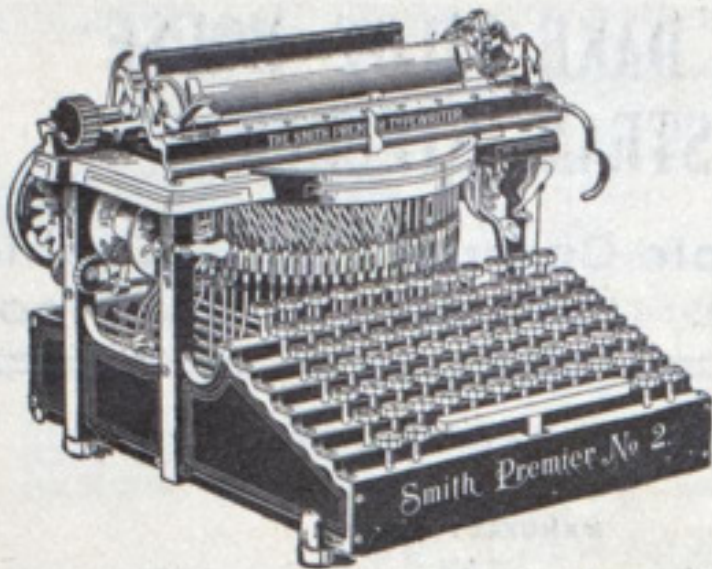
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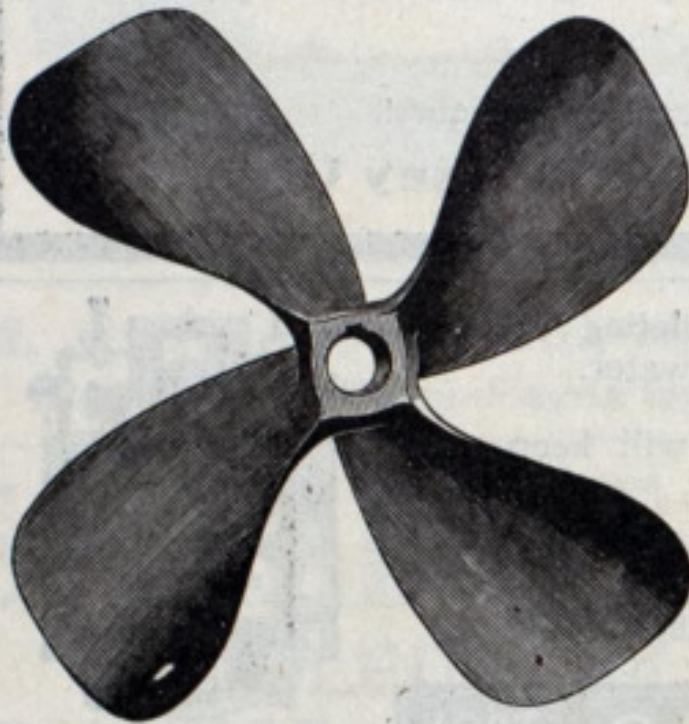
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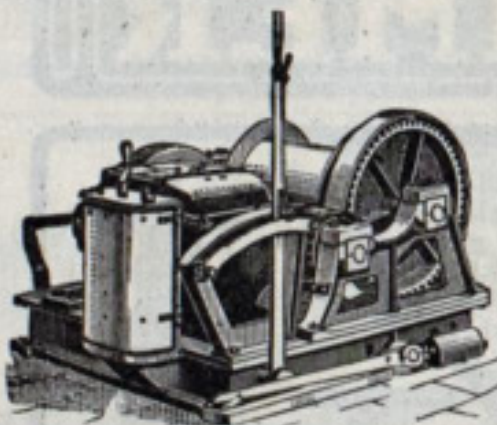


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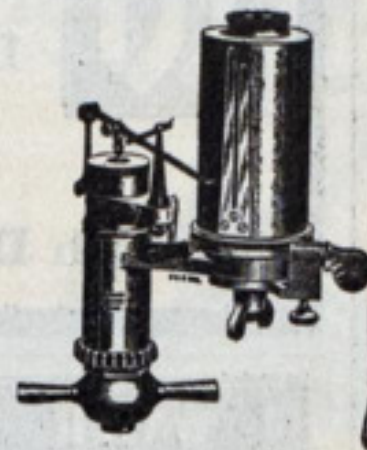
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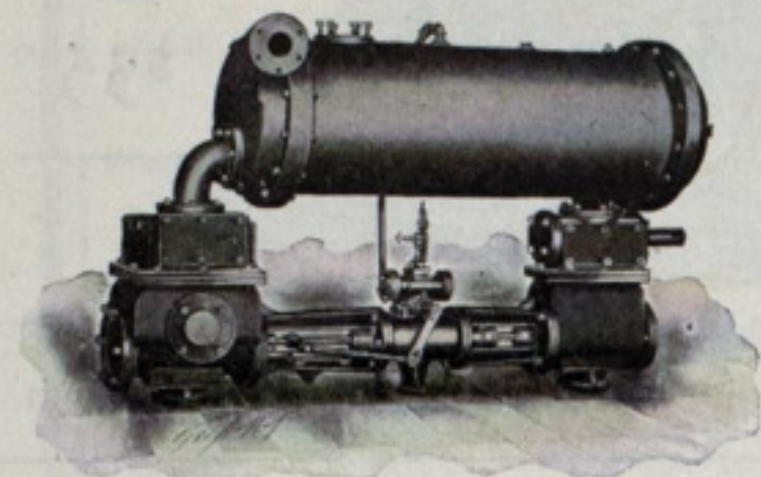
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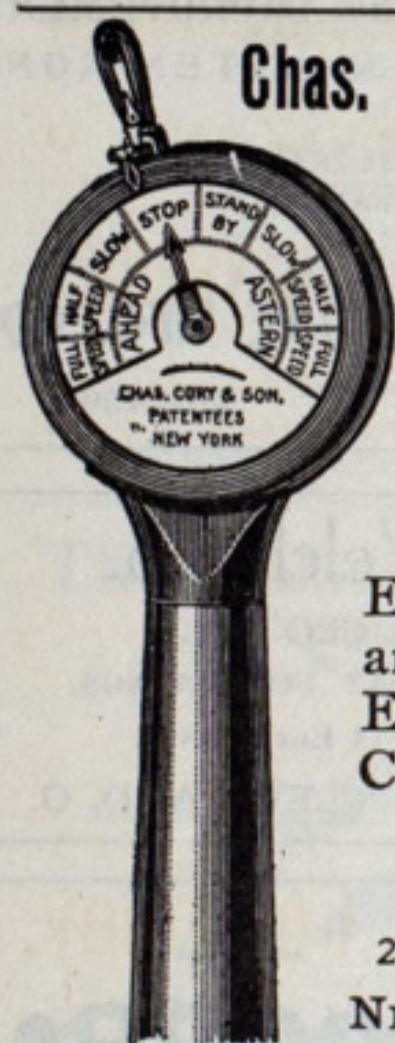
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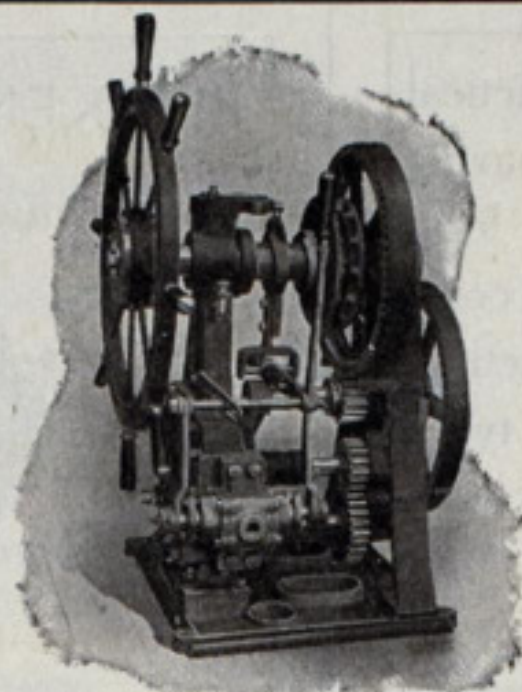
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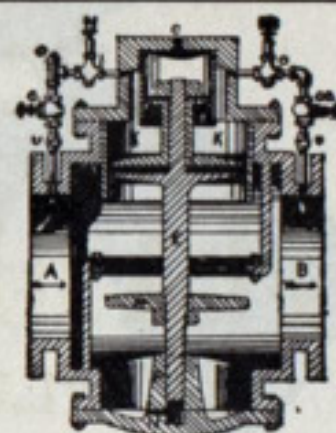
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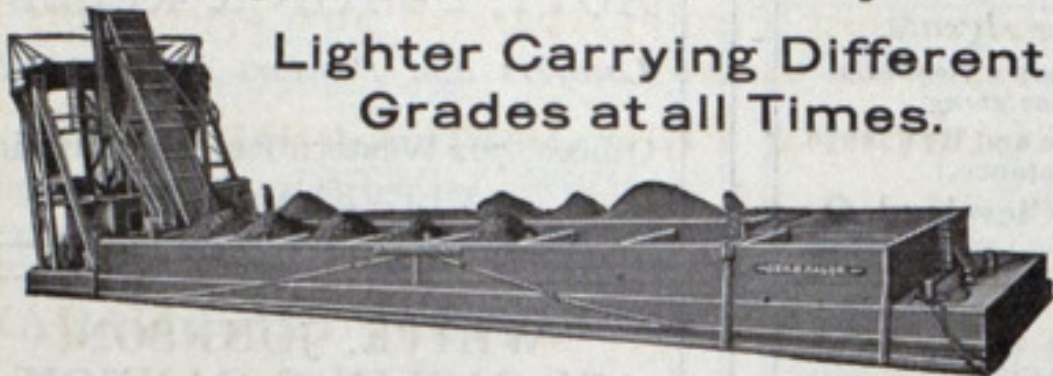
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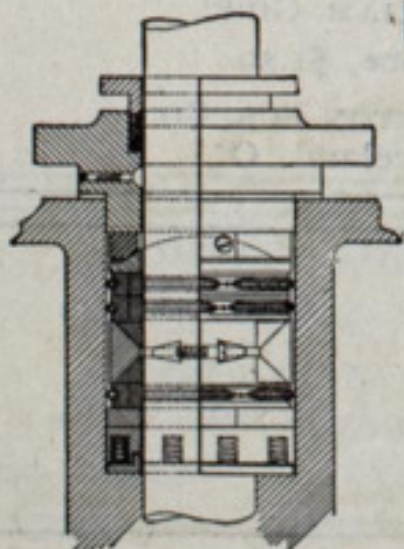
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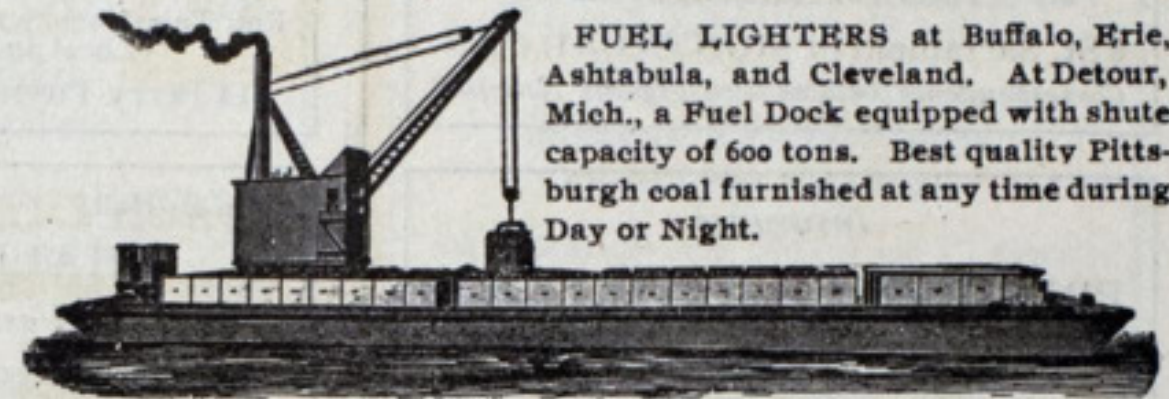
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Stirling, The Co.....Chicago.
Superior Ship Building Co.....Superior, Wis.
Taylor Water Tube Boiler Co.....Detroit.
Union Machine & Boiler Co.....Cleveland.
United States Ship Building Co.....New York.
Willard, Chas. P. & Co.....Chicago.

BOILER COMPOUNDS.

Dearborn Drug & Chemical Works.....Chicago.

BOILER RIVETS.

Bourne-Fuller Co.....Cleveland.

BOILER STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.

Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

BOOKS, NAUTICAL AND ENGINEERING.

Marine Review Pub. Co.....Cleveland.

BRASS AND BRONZE CASTINGS.

Cramp, Wm. & Sons.....Philadelphia.
Fore River Ship & Engine Co.....Quincy, Mass.
Great Lakes Engineering Works.....Detroit.
Lunkenheimer Co.....Cincinnati.
Macbeth Iron Co.....Cleveland.
Phosphor Bronze Smelting Co.....Philadelphia.
Victor Metals Co.....Braintree, Mass.

BRIDGES, BUILDERS OF.

Scherzer Rolling Lift Bridge Co.....Chicago.

BUCKETS, ORE AND COAL.

Brown Hoisting & Conveying Machine Co.....Cleveland.
Macbeth Iron Co.....Cleveland.

CABIN AND CABINET FINISHING WOODS.

Martin-Barriss Co.....Cleveland.

CAPSTANS.

American Ship Windlass Co.....Providence, R. I.
Hyde Windlass Co.....Bath, Me.
Marine Mfg. & Supply Co.....New York.

CARPETS, FURNITURE, BEDS, ETC.

Meckes, John.....Cleveland.
Siegel, Cooper Co.....New York.
Sterling & Welch Co.....Cleveland.

CEMENT, IRON FOR REPAIRING LEAKS.

Smooth-On Mfg. Co.....Jersey City, N. J.

CHAINS.

Lebanon Chain Works.....Lebanon, Pa.
Standard Chain Co.....Pittsburg.

CHAIN HOISTS.

Boston & Lockport Block Co.....Boston, Mass.
Dake Engine Co.....Grand Haven, Mich.

CHARTS.

Marine Review Pub. Co.....Cleveland.
Potter, J. D.....London.

CLOCKS (Marine and Ship's Bell) AND CHRONOMETERS.

Ashton Valve Co.....Boston.
Chelsea Clock Co.....Boston.
Ritchie, E. S. & Sons.....Brookline, Mass.
Standard Gauge Mfg. Co.....Syracuse, N. Y.

COAL PRODUCERS AND SHIPPERS.

Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.
Pittsburg Coal Co.....Cleveland.

COAL AND ORE HANDLING MACHINERY.

Brown Hoisting Machinery Co (Inc.).....Cleveland.
Lidgerwood Mfg. Co.....New York.
Macbeth Iron Co.....Cleveland.

COMPASS ADJUSTERS.

Fields, Capt. J. M.....Cleveland.

COMPASSES.

Ritchie, E. S. & Sons.....Brookline, Mass.

CONCRETE MIXERS.

Contractors Supply & Equipment Co.....Chicago.

CONDENSERS.

Great Lakes Engineering Works.....Detroit.
Thropp & Sons Co., John E.....Trenton, N. J.

CONTRACTORS, SUPPLIES.

Contractors Supply & Equipment Co.....Chicago.

CONTRACTORS FOR PUBLIC WORKS.

Buffalo Dredging Co.....Buffalo.
Chicago & Gt. Lakes Dredge & Dock Co.....Chicago.
Dunbar & Sullivan Dredging Co.....Buffalo.
Fitz-Simons & Connell Co.....Chicago.
Hickler Bros.....Sault Ste. Marie, Mich.
Smith Co., L. P. & J. A.....Cleveland.
Starke Dredge & Dock Co., C. H.....Milwaukee.

CORDAGE.

Baker & Co., H. H.....Buffalo.
DeGrauw, Aymar & Co.....New York.
Upson-Walton Co.....Cleveland.

CORK JACKETS AND RINGS.

Armstrong Cork Co.....Pittsburg, Pa.
Kahnweiler's Sons, D.....New York.
Lane & DeGroot.....Long Island City, N. Y.

COURSE FINDER.

Fields' Patent Course Finder.....Cleveland.

CHAIN CONVEYORS, HOISTS.

Brown Hoisting Machinery Co (Inc.).....Cleveland.
General Electric Co.....Schenectady, N. Y.
Lidgerwood Mfg. Co.....New York.
Westinghouse Electric & Mfg. Co.....Pittsburg, Pa.

CRANES, TRAVELING.

Brown Hoisting Machinery Co.....Cleveland.
Lidgerwood Mfg. Co.....New York.
Pawling & Harnischfeger.....Milwaukee.

DISTANCE FINDER.

Nicholson Ship Log Co.....Cleveland.

DIVING APPARATUS.

Morse, A. J. & Son.....Boston.
Schrader's Son, A.....New York.

DREDGING CONTRACTORS.

Buffalo Dredging Co.....Buffalo.
Chicago & Gt. Lakes Dredge & Dock Co.....Chicago.
Dunbar & Sullivan Dredging Co.....Buffalo.
Fitz-Simons & Connell Co.....Chicago.
Hickler Bros.....Sault Ste. Marie, Mich.
Smith Co., L. P. & J. A.....Cleveland.
Starke Dredge & Dock Co., C. H.....Milwaukee.

DRYING APPARATUS.

Bayley & Sons Co., Wm.....Milwaukee, Wis.
Sturtevant, B. F. Co.....Boston.

DRY DOCKS.

American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Buffalo Dry Dock Co.....Buffalo.
Chicago Ship Building Co.....Chicago.
Craig Ship Building Co.....Toledo, O.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Ship Building Co.....Detroit.
Great Lakes Engineering Works.....Detroit.
Lockwood Mfg. Co.....East Boston, Mass.
Manitowoc Dry Dock Co.....Manitowoc, Wis.
Milwaukee Dry Dock Co.....Milwaukee.
Newport News Ship Building Co.....Newport News, Va.
Shipowners Dry Dock Co.....Chicago.
Superior Ship Building Co.....Superior, Wis.
United States Ship Building Co.....New York.

Buyers' Directory of the Marine Trade.—Continued.

ELECTRIC HOISTS AND CRANES.

General Electric Co.....Schenectady, N. Y.
 Lidgerwood Mfg. Co.....New York.
 Pawling & Harnischfeger.....Milwaukee.
 Westinghouse Electric & Mfg. Co.....Pittsburg, Pa.

ELECTRIC LIGHT AND POWER PLANTS.

Bayley & Sons Co., Wm. Milwaukee, Wis.
 General Electric Co.....Schenectady, N. Y.
 Sturtevant, B. F. Co.....Boston.
 Thropp & Sons, John E. Trenton, N. J.
 Westinghouse Electric & Mfg. Co.....Pittsburg, Pa.

ENGINE BUILDERS, MARINE.

American Ship Building Co.....Cleveland.
 Atlantic Works.....East Boston, Mass.
 Chicago Ship Building Co.....Chicago.
 Chase Machine Co.....Cleveland.
 Cramp, Wm. & Sons.....Philadelphia.
 Craig Ship Building Co.....Toledo, O.
 Dake Engine Co.....Grand Haven, Mich.
 Detroit Ship Building Co.....Detroit.
 Fletcher, W. & A. Co.....Hoboken, N. J.
 Fore River Ship & Engine Co.....Quincy, Mass.
 Great Lakes Engineering Works.....Detroit, Mich.
 Hall Bros.....Philadelphia.
 Jenks Ship Building Co.....Port Huron, Mich.
 Lockwood Mfg. Co.....East Boston, Mass.
 Macbeth Iron Co.....Cleveland.
 Milwaukee Dry Dock Co.....Milwaukee.
 Mosher, Chas. D.....New York.
 Moulton Steering Engine Co.....New York.
 Newport News Ship Building Co.....Newport News, Va.
 Northwestern Steam Boiler & Mfg. Co.....Duluth, Minn.
 Risdon Iron Works.....San Francisco.
 Roach's Ship Yard.....Chester, Pa.
 Sheriffs Mfg. Co.....Milwaukee.
 Superior Ship Building Co.....Superior, Wis.
 Thropp, J. E. & Sons Co.....Trenton, N. J.
 Trout, H. G.....Buffalo.
 United States Ship Building Co.....New York.
 Willard, Chas. P. & Co.....Chicago.

ENGINE ROOM TELEGRAPH, CALL BELLS, ETC.

Cory, Chas. & Son.....New York.
 Marine Mfg. & Supply Co.....New York.

ENGINEERING SPECIALTIES AND SUPPLIES.

Crane Co.....Chicago.
 Kieley & Mueller.....New York.
 Lunkenheimer Co.....Cincinnati.
 Mooers & Co., H.....Milwaukee.
 New York Belting & Packing Co.....New York.
 Northwestern Steam Boiler & Mfg. Co.....Duluth, Minn.

ENGINEERS, MARINE, MECHANICAL,
CONSULTING.

Hynd, Alexander.....Cleveland.
 Hunt, Robt. W. & Co.....Chicago.
 Kidd, Joseph.....Duluth, Minn.
 Lovejoy, H. O.....Buffalo.
 Matteson & Drake.....Philadelphia.
 Mosher, Chas. D.....New York.
 Nacey, James.....Cleveland.
 Pittsburg Testing Laboratory, Ltd.....Pittsburg.
 Rice, Henry.....Buffalo.
 Roelker, H. B.....New York.
 Sadler, Perkins & Field.....New York.
 Steel, Adam.....Cleveland.
 Wood, W. J.....Chicago.

FANS FOR VENTILATION, EXHAUST, ETC.

Sturtevant, B. F. Co.....Boston.

FEED WATER PURIFIERS AND HEATERS.

Learmonth, Robert.....Buffalo.
 Ross Valve Co.....Troy, N. Y.

FIXTURES FOR LAMPS, OIL OR ELECTRIC.

General Electric Co.....Schenectady, N. Y.
 Westinghouse Electric & Mfg. Co.....Pittsburg, Pa.

FORGES.

Sturtevant, B. F. Co.....Boston.

FORGINGS FOR CRANK, PROPELLER OR
THRUST SHAFTS, ETC.

Cleveland City Forge & Iron Co.....Cleveland.
 Fore River Ship & Engine Co.....Quincy, Mass.
 Macbeth Iron Co.....Cleveland.

FLUE WELDING.

Fix's, S. Sons.....Cleveland.

FURNACES FOR BOILERS.

Continental Iron Works.....New York.

FUELING COMPANIES AND COAL DEALERS.

Hanna, M. A. & Co.....Cleveland.
 Ironville Dock & Coal Co.....Toledo, O.
 Jarker Bros. Co., Ltd.....Detroit.
 Pickands, Mather & Co.....Cleveland.
 Pittsburg Coal Co.....Cleveland.
 Smith, Stanley B., & Co.....Detroit.
 Smith Coal & Dock Co., Stanley B.....Toledo, O.
 Youghiogheny & Lehigh Valley Coal Co.....Chicago.

GASKETS, RUBBER.

New York Belting & Packing Co.....New York.

GAS BUOYS.

Safety Car Heating & Lighting Co.....New York.

GAS AND GASOLINE ENGINES.

Chase Machine Co.....Cleveland.
 Georgian Bay Engineering Works.....Midland, Ont.
 Temple Pump Co.....Chicago.

GAUGES, STEAM AND VACUUM.

American Steam Gauge Co.....Boston.
 Ashton Valve Co.....Boston.
 Lunkenheimer Co.....Cincinnati.
 Standard Gauge Mfg. Co.....Syracuse, N. Y.

GAUGES, WATER.

Bonner & Co., Wm. T.....Boston.
 Lunkenheimer Co.....Cincinnati, O.
 Standard Gauge Mfg. Co.....Syracuse, N. Y.

GRAPHITE.

Dixon Crucible Co., Joseph.....Jersey City, N. J.

HAMMERS, STEAM.

Chase Machine Co.....Cleveland.

HEATING APPARATUS.

Bayley & Sons Co., Wm. Milwaukee, Wis.
 Sturtevant, B. F. Co.....Boston.

HOISTS FOR CARGO, ETC.

American Ship Building Co.....Cleveland.
 Brown Hoisting Machinery Co. (Inc.).....Cleveland.
 Chase Machine Co.....Cleveland.
 Elwell-Parker Electric Co.....Cleveland.
 General Electric Co.....New York.
 Georgian Bay Engineering Works.....Midland, Ont.
 Hyde Windlass Co.....Bath, Me.
 Lidgerwood Mfg. Co.....New York.
 Marine Iron Co.....Bay City.
 Pawling & Harnischfeger.....Milwaukee.
 Westinghouse Electric & Mfg. Co.....Pittsburg, Pa.

HOLLOW STAYBOLT IRON.

Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

HOSE, RUBBER.

New York Belting & Packing Co.....New York.

HYDRAULIC DREDGES.

Great Lakes Engineering Works.....Detroit.

HYDRAULIC TOOLS.

Watson-Stillman Co., The.....New York.

ICE MACHINERY.

Great Lakes Engineering Works.....Detroit.
 Roelker, H. B.....New York.

INDICATORS FOR STEAM ENGINES.

American Steam Gauge Co.....Boston.
 Ashton Valve Co.....Boston.

INJECTORS.

American Injector Co.....Detroit.
 Crane Co.....Chicago.
 Jenkins Bros.....New York.
 Lunkenheimer Co.....Cincinnati.
 Penberthy Injector Co.....Detroit, Mich.

INSURANCE, MARINE.

Elphicke, C. W. & Co.....Chicago.
 Fleming & Co., P. H.....Chicago.
 Frankfort Marine, A. & P. G. Ins. Co.....New York.
 Gilchrist & Co., C. P.....Cleveland.
 Hawgood & Co., W. A.....Cleveland.
 Helm & Co., D. T.....Duluth.
 Hutchinson & Co.....Cleveland.
 McCarthy, T. R.....Montreal.
 McCurdy, Geo. L.....Chicago.
 Mitchell & Co.....Cleveland.
 Parker Bros. Co., Ltd.....Detroit.
 Peck, Chas. E. & W. F.....New York and Chicago.
 Prindiville & Co.....Chicago.

INSURANCE, MARINE.—Continued.

Richardson, W. C.....Cleveland.
 Sullivan, D. & Co.....Chicago.
 Voss, F. D.....New York.
 Weeks, F. H.....New York.

IRON ORE AND PIG IRON.

Bourne-Fuller Co.....Cleveland.
 Hanna, M. A. & Co.....Cleveland.
 Pickands, Mather & Co.....Cleveland.

LAUNCHES—STEAM, NAPHTHA, ELECTRIC.

Georgian Bay Engineering Works.....Midland, Ont.
 Marine Construction & D. D. Co.....
Mariner's Harbor, S. I., N. Y.
 Truscott Boat Mfg. Co.....St. Joseph, Mich.
 Willard, Chas. P.....Chicago.

LIFE PRESERVERS, LIFE BOATS, BUOYS.

Armstrong Cork Co.....Pittsburg.
 Carley Life Float Co.....New York.
 Drein, Thos. & Son.....Wilmington, Del.
 Kahnweiler's Sons, D.....New York.
 Lane & DeGroot.....Long Island City, N. Y.
 Marine Construction & Dry Dock Co.....
Mariner's Harbor, S. I., N. Y.

LIGHTS, SIDE AND SIGNAL.

Russell & Watson.....Buffalo.

LOGS.

Nicholson Ship Log Co.....Cleveland.
 Walker & Sons, Thomas.....Birmingham, Eng.
 Also Ship Chandlers.

LUBRICATING GRAPHITE.

Dixon Crucible Co., Joseph.....Jersey City, N. J.

LUBRICATORS.

Crane Co.....Chicago.
 Lunkenheimer Co.....Cincinnati.

LUMBER.

Martin-Barriss Co.....Cleveland.
 Shurick, F. S.....New York.

MACHINISTS.

Chase Machine Co.....Cleveland.
 Gogebic Steam Boiler Works.....Duluth, Minn.
 Hickler Bros.....Sault Ste. Marie, Mich.
 Lockwood Mfg. Co.....East Boston, Mass.
 Macbeth Iron Co.....Cleveland.
 Mooers & Co., H.....Milwaukee.
 Union Machine & Boiler Co.....Cleveland.

MACHINE TOOLS (WOOD WORKING).

Atlantic Works, Inc.....Philadelphia.

MARINE RAILWAYS.

Hickler Bros.....Sault Ste. Marie, Mich.

MARINE GLUE.

Ferdinand & Co., L. W.....Boston, Mass.

MARINE RAILWAYS, BUILDERS OF.

Crandall & Son, H. I.....East Boston, Mass.

MATTRESSES, CUSHIONS, BEDDING.

Fogg, M. W.....New York.
 Meckes John.....Cleveland.
 Siegel Cooper Co.....New York.
 Sterling & Welch Co.....Cleveland.

MECHANICAL DRAFT FOR BOILERS.

American Ship Building Co.....Cleveland.
 Detroit Ship Building Co.....Detroit.
 Great Lakes Engineering Works.....Detroit.
 Sturtevant, B. F. Co.....Boston.

MELTING POT AND PAYING LADLE.

(For Paying Seams of Decks with Marine Glue.)
 Ferdinand & Co., L. W.....Boston

METALLIC PACKING.

Katzenstein, L. & Co.....New York.
 U. S. Metallic Packing Co.....Philadelphia.

METAL POLISH.

Bertram's Oil Polish Co.....Boston.

MOTORS, GENERATORS—ELECTRIC.

General Electric Co.....Schenectady, N. Y.
 Bayley & Sons Co., Wm. Milwaukee, Wis.
 Sturtevant, B. F. Co.....Boston.
 Westinghouse Electric & Mfg. Co.....Pittsburg, Pa.

NAUTICAL INSTRUMENTS.

Ritchie, E. S. & Sons.....Brookline, Mass.

Buyers' Directory of the Marine Trade.—Continued.

NAVAL ARCHITECTS.

Hynd, AlexanderCleveland.
 Kidd, JosephDuluth, Minn.
 Lovejoy, H. O.Buffalo.
 Matteson & DrakePhiladelphia.
 Mosher, Chas. D.New York.
 Nacey, JamesCleveland.
 Rice, HenryBuffalo.
 Sadler, Perkins & Field.....New York.
 Steel, AdamCleveland.
 Wood, W. J.Chicago.

OAKUM.

DeGrauw, Aymar & Co.....New York.
 Stratford Oakum CoJersey City, N. J.

OIL FOR PAINTING.

Sipe & Co., James B.....Allegheny, Pa.

OILS AND LUBRICANTS.

Dixon Crucible Co., Joseph.....Jersey City, N. J.
 Standard Oil Co.....Cleveland

PACKING.

American Steam Packing Co.....Boston.
 Crane Co.Chicago.
 Jenkins Bros.New York.
 Katzenstein, L. & Co.....New York.
 New York Belting & Packing Co.....New York.
 United States Metallic Packing Co....Philadelphia

PAINTS.

Baker, Howard H. & Co.....Buffalo.
 Detroit Varnish Co.....Detroit.
 Detroit White Lead Works.....Detroit.
 Forest City Paint and Varnish CoCleveland.
 New Jersey Zinc Co.....New York.
 Sipe & Co., James B.....Allegheny, Pa.
 Upson-Walton Co.Cleveland

PATENT ATTORNEYS.

Thurston & BatesCleveland.

PATTERN SHOP MACHINERY.

Atlantic Works, Inc.....Philadelphia

PILE DRIVING AND SUBMARINE WORK.

Buffalo Dredging CoBuffalo.
 Chicago & Gt. Lakes Dredge & Dock Co...Chicago.
 Dunbar & Sullivan Dredging Co.....Buffalo.
 Fitz-Simon & Connell Co.....Chicago.
 Hickler Bros.....Sault Ste. Marie, Mich.
 Parker Bros. Co., Ltd.Detroit.
 Smith Co., L. P. & J. A.....Cleveland.
 Starke Dredge & Dock Co., C. H.....Milwaukee.

PIPE, WROUGHT IRON.

Bourne-Fuller Co.....Cleveland.
 Crane Co.Chicago.
 Macbeth Iron Co.Cleveland.

PLANING MILL MACHINERY.

Atlantic Works, Inc.....Philadelphia.

PLATES—SHIP, STRUCTURAL, ETC.

Bourne-Fuller Co.Cleveland.
 Otis Steel CoCleveland.

PNEUMATIC TOOLS.

Allen, John F.....New York.

POLISH FOR METALS.

Bertram's Oil Polish Co.....Boston.

PRESSURE REGULATORS.

Kieley & MuellerNew York.
 Ross Valve Co.....Troy, N. Y.

PROPELLER WHEELS.

American Ship Building Co.....Cleveland.
 Atlantic WorksEast Boston, Mass.
 Cramp, Wm. & Sons.....Philadelphia.
 Detroit Ship Building Co.....Detroit.
 Fore River Ship & Engine Co.....Quincy, Mass.
 Great Lakes Engineering Works.....Detroit.
 Hyde Windlass Co.....Bath, Me.
 Jenks Ship Building Co.....Port Huron, Mich.
 Lockwood Mfg. Co.....East Boston, Mass.
 Macbeth Iron Co.....Cleveland.
 Milwaukee Dry Dock Co.....Milwaukee.
 Newport News Ship Building Co.Newport News, Va.
 Phosphor Bronze Smelting Co., Ltd.....Philadelphia.
 Risdon Iron WorksSan Francisco.
 Roelker, H. B.....New York.
 Sheriff's Mfg. Co.....Milwaukee.
 Superior Shipbuilding Co.....Superior, Wis.
 Thropp & Sons Co., J. E.....Trenton, N. J.
 Trout, H. G.....Buffalo.
 United States Ship Building Co.....New York.

PROJECTORS, ELECTRIC.

General Electric Co.....Schenectady, N. Y.
 Westinghouse Electric & Mfg. Co.....Pittsburg, Pa.

PUMPS FOR VARIOUS PURPOSES.

Blake, Geo. F., Mfg. Co.....New York.
 Great Lakes Engineering Works.....Detroit.
 Kingsford Foundry & Machine Wks., Oswego, N. Y.
 Temple Pump Co.....Chicago.

PUNCHES, RIVETERS, SHEARS.

Allen, John F.....New York.

RANGES.

Russell & WatsonBuffalo.

REFRIGERATING APPARATUS.

Great Lakes Engineering Works.....Detroit.
 Roelker, H. B.....New York.

REGISTER FOR CLASSIFICATION OF VESSELS.

Great Lakes RegisterCleveland.
 Record of American & Foreign Shipping..New York.

REPAIRS—ENGINE AND BOILER.

(See also Boiler Manufacturers and Engine Builders.)
 Georgian Bay Engineering WorksMidland, Ont.
 Gogebic Steam Boiler Works.....Duluth, Minn.
 Marine Iron Co.....Duluth, Minn.
 Forest City Boiler Co.....Cleveland.

RIVETING MACHINES.

Allen, John F.....New York.

RIVETS, STEEL, FOR SHIPS AND BOILERS.

Bourne-Fuller Co.....Cleveland.

SAFETY VALVES.

American Steam Gauge Co.....Boston.
 Ashton Valve Co.....Boston.
 Crane Co.Chicago.
 Hayden Mfg. Co., N. L.....Columbus, O.
 Lunkenheimer Co.Cincinnati.

SAIL MAKERS.

Baker, Howard H. & Co.....Buffalo.
 Upson-Walton Co.....Cleveland.
 Willson & SilsbyBoston.

SALVAGE COMPANIES.

See Wrecking Companies.

SEARCH LIGHTS.

General Electric Co.....Schenectady, N. Y.
 Westinghouse Electric & Mfg. Co.....Pittsburg, Pa.

SHEARS.

See Punches, Rivets, and Shears.

SHIP AND BOILER PLATES AND SHAPES.

Bourne-Fuller Co.....Cleveland.
 Otis Steel CoCleveland.

SHIP BUILDERS.

American Ship Building Co.....Cleveland.
 Atlantic WorksEast Boston, Mass.
 Buffalo Dry Dock Co.....Buffalo.
 Cramp, Wm. & Sons.....Philadelphia.
 Craig Ship Building Co.....Toledo, O.
 Chicago Ship Building Co.....Chicago.
 Detroit Ship Building Co.....Detroit.
 Fore River Ship & Engine Co.....Quincy, Mass.
 Great Lakes Engineering Works.....Detroit.
 Jenks Ship Building Co.....Port Huron, Mich.
 Lockwood Mfg. Co.....East Boston, Mass.
 Manitowoc Dry Dock Co.....Manitowoc, Wis.
 Milwaukee Dry Dock Co.....Milwaukee.
 Newport News Ship Building Co.Newport News, Va.
 Risdon Iron WorksSan Francisco.
 Roach's Ship Yard.....Chester, Pa.
 Shipowner's Dry Dock Co.....Chicago.
 Smith & Son, AbramAlgonac, Mich.
 United States Ship Building Co.....New York.
 Willard, Chas. P. & Co.....Chicago.

SHIP CHANDLERS.

Baker, Howard H. & Co.....Buffalo.
 Marine Mfg. & Supply Co.....New York.
 Upson-Walton Co.....Cleveland.

SHIP LANTERNS AND LAMPS.

Russell & WatsonBuffalo.

SHIP TIMBER.

Martin-Barriss Co.Cleveland.

SMOOTH-ON COMPOUND, FOR REPAIRS.

Smooth-On Mfg. Co.....Jersey City, N. J.

STAYBOLTS, IRON OR STEEL, HOLLOW, OR, SOLID.

Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

STEAM VESSELS FOR SALE.

Elwell, Jas. W. & Co.....New York.
 Gilchrist & Co., C. P.....Cleveland.
 Holmes, SamuelNew York.
 McCarthy, T. R.....Montreal, Can.
 Weeks, F. H.....New York.

STEAMSHIP LINES, PASS. AND FREIGHT.

American Line.....New York.
 Anchor Line.....Buffalo.
 Erie & Western Trans Co.....Buffalo.
 Goodrich Trans. Co.....Chicago.
 International Mercantile Marine Co.....Philadelphia.
 Manitou Steamship Co.....Chicago.
 Mexican-American S. S. CoNew Orleans, La.
 Niagara, St. Catharines & Toronto Ry. & Nav. Co.....St. Catharines Ont.
 Northern Michigan Trans CoChicago.
 Red Star LineNew York.
 United Fruit CoBoston.

STEEL CASTINGS.

Macbeth Iron Co.....Cleveland.
 Otis Steel Co.....Cleveland.
 Seaboard Steel Casting Co.....Chester, Pa.

STEERING APPARATUS.

American Ship Building Co.....Cleveland.
 Chase Machine Co.....Cleveland.
 Dake Engine Co.....Grand Haven, Mich.
 Detroit Ship Building Co.....Detroit.
 Hyde Windlass Co.....Bath, Me.
 Jenks Ship Building Co.....Port Huron, Mich.
 Marine Mfg. & Supply Co.....Cleveland.
 Moulton Steering Engine Co.....New York.
 Pawling & HarnischfegerMilwaukee.
 Sheriff's Mfg. Co.Milwaukee.

SUBMARINE DIVING APPARATUS.

Morse & Son, A. J.....Boston.
 Schrader's Son, A.....New York.

SURVEYORS, MARINE.

Gaskin, EdwardBuffalo.
 Hynd, AlexanderCleveland.
 Lovejoy, H. O.Buffalo.
 Matteson & DrakePhiladelphia.
 Parker Bros. Co., Ltd.Detroit.
 Nacey, JamesCleveland.
 Rice, HenryBuffalo.
 Steel, AdamCleveland.
 Wood, W. J.Chicago.

TESTS OF MATERIALS.

Hunt, Robert W. & Co.....Chicago.
 Pittsburg Testing Laboratory Ltd.....Pittsburg.

TILING, INTERLOCKING RUBBER.

New York Belting & Packing Co.....New York.

TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.

Allen, John F.....New York.
 Watson-Stillman Co.New York.

TOOLS, WOOD WORKING.

Atlantic Works, Inc.....Philadelphia.

TOWING MACHINES.

American Ship Windlass Co.....Providence, R. I.
 Chase Machine Co.....Cleveland.

TOWING COMPANIES.

Donnelly Salvage & Wrecking Co....Kingston, Ont.
 Great Lakes Towing Co.....Cleveland.
 Midland Towing & Wrecking Co., Ltd.Midland, Ont.

TRAPS, STEAM.

Kieley & MuellerNew York.
 Lunkenheimer Co.Cincinnati.
 Sturtevant Co., B. F., Jamaica Plain.....Boston.

Buyers' Directory of the Marine Trade.—Continued.

TRUCKS.		VESSEL AND FREIGHT AGENTS.		WHISTLES, STEAM.	
Boston & Lockport Block Co.	Boston.	Boland, John J.	Buffalo.	American Steam Gauge Co.	Boston.
		Brown & Co.	Buffalo.	Ashton Valve Co.	Boston.
		Elwell, Jas. W. & Co.	New York.	Lunkenheimer Co.	Cincinnati.
		Elphicke, C. W. & Co.	Chicago.		
		Fleming & Co., P. H.	Chicago.		
		Gilchrist & Co., C. P.	Cleveland.		
		Hall & Root	Buffalo.		
		Helm & Co., D. T.	Duluth.		
		Hawgood & Co., W. A.	Cleveland.		
		Holmes, Samuel	New York.		
		Hutchinson & Co.	Cleveland.		
		Lester, S. S.	Quebec, Can.		
		McCarthy, T. R.	Montreal.		
		Mitchell & Co.	Cleveland.		
		Parker Bros. Co., Ltd.	Detroit.		
		Prindiville & Co.	Chicago.		
		Richardson, W. C.	Cleveland.		
		Sullivan, D. & Co.	Chicago.		
		Weeks, F. H.	New York.		
TUBING, SEAMLESS.		WATER GAUGES.		WINDLASSES.	
Shelby Steel Tube Co.	Pittsburg, Pa.	Boaner & Co., Wm. T.	Boston	American Ship Windlass Co.	Providence, R. I.
		Lunkenheimer Co.	Cincinnati, O.	American Ship Building Co.	Cleveland.
				Hyde Windlass Co.	Bath, Me.
				Jenks Ship Building Co.	Port Huron, Mich.
				Marine Mfg. & Supply Co.	New York.
VALVES, STEAM SPECIALTIES, ETC.		VESSEL FURNISHINGS.		WINCHES.	
American Steam Gauge Co.	Boston.	Meckes, John	Cleveland	American Ship Windlass Co.	Providence, R. I.
Ashton Valve Co.	Boston.	Siegel Cooper Co.	New York.	Georgian Bay Engineering Works	Midland, Ont.
Crane Co.	Chicago.	Sterling & Welch Co.	Cleveland.	Hyde Windlass Co.	Bath, Me.
Jenkins Bros.	New York.				
Kieley & Mueller	New York.				
Lunkenheimer Co.	Cincinnati.				
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		DeGrauw, Aymar & Co.	New York.		
		Upson-Walton Co.	Cleveland.		
VARNISHES.		WRECKING AND SALVAGE COMPANIES.		YACHT AND BOAT BUILDERS.	
Detroit Varnish Co.	Detroit.	Donnelly Salvage & Wrecking Co.	Kingston, Ont.	Dreln, Thos. & Son	Wilmington, Del.
Detroit White Lead Works	Detroit.	Great Lakes Towing Co.	Cleveland	Georgian Bay Engineering Works	Midland, Ont.
Forest City Paint & Varnish Co.	Cleveland	Midland Towing & Wrecking Co., Ltd.	Midland, Ont.	Lane & DeGroot	Long Island City, N. Y.
New Jersey Zinc Co.	New York.	Parker Bros. Co., Ltd.	Detroit.	Marine Construction & Dry Dock Co.	New York.
Also Ship Chandlers.				Truscott Boat Mfg. Co.	St. Joseph, Mich.
				Willard, Chas. P. & Co.	Chicago.
VENTILATING APPARATUS FOR SHIPS.		YAWLS.			
Bayley & Sons Co., Wm.	Milwaukee, Wis.	Dreln, Thos. & Son	Wilmington, Del.		
Sturtevant, B. F. Co.	Boston.	Lane & DeGroot	Long Island City, N. Y.		

ALPHABETICAL INDEX OF ADVERTISERS IN THE MARINE REVIEW.

The star (*) indicates that the advertisement appears alternate weeks. For addresses see advertisements on pages noted.
The dagger (†) indicates that advertisement appears once a month.

*Allen, John F.	3	Falls Hollow Staybolt Co.	47	McCarthy, T. R.	48	Russell & Watson	40
Almy Water Tube Boiler Co.	43	Faust, Wm. H.	48	McCurdy, Geo. L.	44	Sadler, Perkins & Field	40
American Bureau of Shipping	44	Ferdinand & Co. L. W.	4			Safety Car Heating & Lighting Co.	8
American Injector Co.	7	Fields, Capt. J. M.	49			Scherzer Rolling Lift Bridge Co.	38-42
American Line	39	Fitz-Simons & Connell Co.	54	Macbeth Iron Co.	56	Schrader's Sons, A.	2
American Ship Building Co.	11	Fix's S. Sons.	46	MacDonald, Ray G.	49	Seaboard Steel Casting Co.	37
American Ship Windlass Co.	2	Fleming & Co., P. H.	48	Manitowoc Dry Dock Co.	41	Shaw, Warren, Cady & Oakes	49
American Steam Gauge Co.	45	Fletcher, W. & A. Co.	41	Manitou Steamship Co.	38	*Shelby Steel Tube Co.	9
Anchor Line	39	Fogg, M. W.	2	Marine Iron Co., Bay City, Mich.	47	Sheriffs Mfg. Co.	44
Armstrong Cork Co.	56	Fore River Ship & Engine Co.	41	Marine Iron Co., Duluth	41	Shipowners' Dry Dock Co.	41
Ashton Valve Co.	12	Forest City Boiler Co.	54	Marine Mfg. & Supply Co.	40	Shipping World	7
Atlantic Works	41	Forest City Paint & Varnish Co.	42	Martin-Barriss Co.	43	Sipe & Co., James B.	6
†Atlantic Works, Inc.	9	Frankfort M. A. & P. G. I. Co.	44	Matteson & Drake	49	*Smith & Son, Abram	47
				Mexican-American S. S. Co.	39	Smith Co., L. P. & J. A.	54
Babcock & Wilcox Co.	8	General Electric Co.	12	Midland Towing & Wrecking Co., Ltd.	56	Smith Premier Typewriter Co.	45
Bayley & Sons Co., Wm.	6	*Georgian Bay Engineering Works	41	Milwaukee Dry Dock Co.	10	Smith Coal & Dock Co., Stanley B.	9
Baldt Anchor Co.	55	Gilchrist, Albert J.	48	Mitchell & Co.	48	Smith, Stanley B. & Co.	9
Baker, Howard H. & Co.	56	Gilchrist & Co., C. P.	48	Morse & Son, A. J.	46	Smooth-On Mfg. Co.	38
Blake, Geo. F., Mfg. Co.	12	Gogebic Steam Boiler Works	41	Mosher Water-Tube Boiler Co.	43	Standard Chain Co.	45
Blickensderfer Mfg. Co.	45	Goodrich Trans. Co.	39	Moulton Steering Engine Co.	42	†Standard Gauge Mfg. Co.	9
Boland, J. J.	48	Goulder, Holding & Masten	48			*Standard Oil Co.	55
*Boston & Lockport Block Co.	37	Great Lakes Engineering Works	5	Nacey, James	49	Starke Dredge & Dock Co., C. H.	54
Bourne-Fuller Co.	12	Great Lakes Register	7	Newport News Ship Building & Dry Dock Co.	41	Steel, Adam	49
Bowers, L. M. & Co.	55	*Great Lakes Towing Co.	11	New Jersey Zinc Co.	6	Sterling & Welch Co.	45
Brown Hoisting Machinery Co., Inc.	2			New York Belting & Packing Co.	7	Stirling Co.	8
Buffalo Dredging Co.	54	Hall & Root	48	Niagara, St. C. & T. Ry. & N. Co.	38	Stratford Oakum Co., Geo.	45
Buffalo Dry Dock Co.	10	Hanna, M. A. & Co.	47	Nicholson Ship Log Co.	38	Sturtevant, B. F. Co.	56
		Hawgood & Co., W. A.	48	Northern Mich. Trans. Co.	38	Sullivan & Co.	48
Chase Machine Co.	6	Helm & Co., D. T.	48	Northwestern Steam Boiler & Mfg. Co.	42	Superior Ship Building Co.	20
*Chelsea Clock Co.	3	Hickler Bros.	54				
Chicago & Gt. L. Dredge & Dock Co.	54	Holmes, Samuel	48	Otis Steel Co.	3		
Chicago Ship Building Co.	10	Hoyt, Dustin & Kelley	48			Taylor Water-Tube Boiler Co.	43
Cleveland City Forge & Iron Co.	47	Hunt, Robert W. & Co.	49	Parker Bros. Co.	48	*Temple Pump Co.	40
Continental Iron Works	2	Hutchinson & Co.	48	Pawling & Harnischfeger	42	Thropp, J. E. & Sons Co.	46
*Contractors' Supply & Equipment Co.	9	Hyde Windlass Co.	56	Peck, Chas. E. & W. F.	44	Thurston & Bates	49
Cory, Chas. & Son	46	Hynd, Alexander	49	*Penberthy Injector Co.	3	Trout, H. G.	45
*Craig Ship Building Co.	11			Phosphor Bronze Smelting Co., Ltd.	40	Truscott Boat Mfg. Co.	40
Cramp, Wm. & Sons, S. & E. B. Co.	41	International Mercantile Marine Co.	39	Pickands, Mather & Co.	47		
*Crandall & Son, H. I.	3	Ironville Dock & Coal Co.	47	Pittsburg Coal Co.	9	Union Machine & Boiler Co.	47
Crane Co.	43-44	Jenkins Brothers	12	Pittsburg Testing Laboratory, Ltd.	49	United Fruit Co.	39
		Jenks Ship Building Co.	11	Potter & Potter	49	Upson-Walton Co.	56
Dake Engine Co.	46			Potter, J. D.	49	U. S. Metallic Packing Co.	56
Dearborn Drug & Chemical Wks.	8	Kahnweiler's Sons, David	40	Powell, Ambrose V.	49	U. S. Ship Building Co.	3
DeGrauw, Aymar & Co.	47	Katzenstein, L. & Co.	47	Prindiville & Co.	48		
Delauney, Belleville & Co.	12	Kidd, Joseph	49	Record of American & Foreign Shipping	44		
Delaware River Iron S. B. & E. Works	41	*Kieley & Mueller	43	Red Star Line	39	Walker, Thomas & Son	43
Detroit Ship Building Co.	11	Kingsford Foundry & Machine Works	42	Rice, Henry	49	*Watson-Stillman Co.	55
Detroit White Lead Works	2	Kremer, C. E.	48	Richardson, W. C.	48	Weeks, F. H.	48
Dixon Crucible Co., Joseph	46			Risdon Iron Works	41	Westinghouse Electric & Mfg. Co.	43
Donnelly Salvage & Wrecking Co.	40	Lackawanna Railroad	55	*Ritchie & Sons, E. S.	44	White, Johnson, McCaslin & Cannon	48
		Lane & DeGroot	40	Roberts Water-Tube Boiler Co.	42	*Willard, Chas. P. & Co.	47
Dreln, Thos. & Son	44	*Learmonth, Robert	40	Roelker, H. B.	41	Wood, W. J.	49
Dunbar & Sullivan Dredging Co.	54	Lebanon Chain Works	46	Ross Valve Co.	46		
Elphicke, C. W. & Co.	48	Lester, S. S.	48				
Elwell, Jas. W. & Co.	48	Lidgerwood Mfg. Co.	45				
Erie & Western Trans. Co.	39	Lockwood Mfg. Co.	41				
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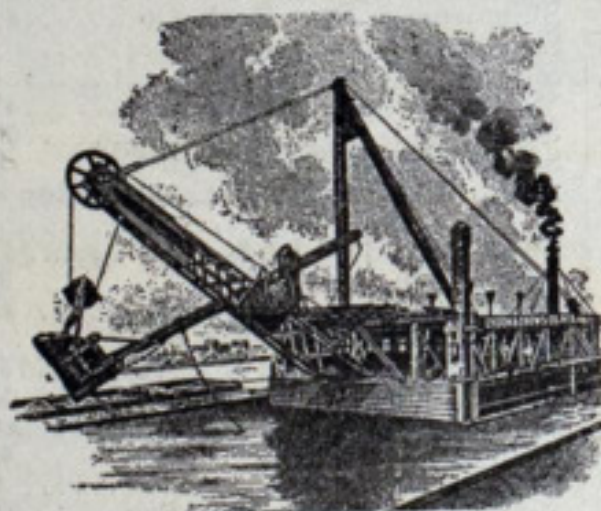
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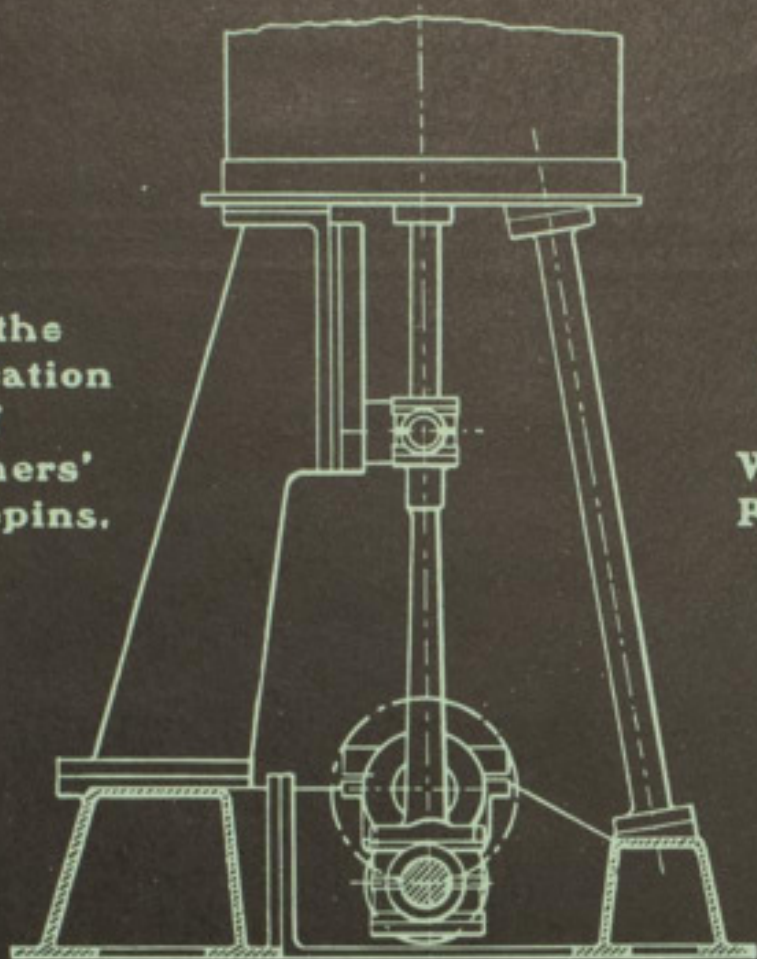
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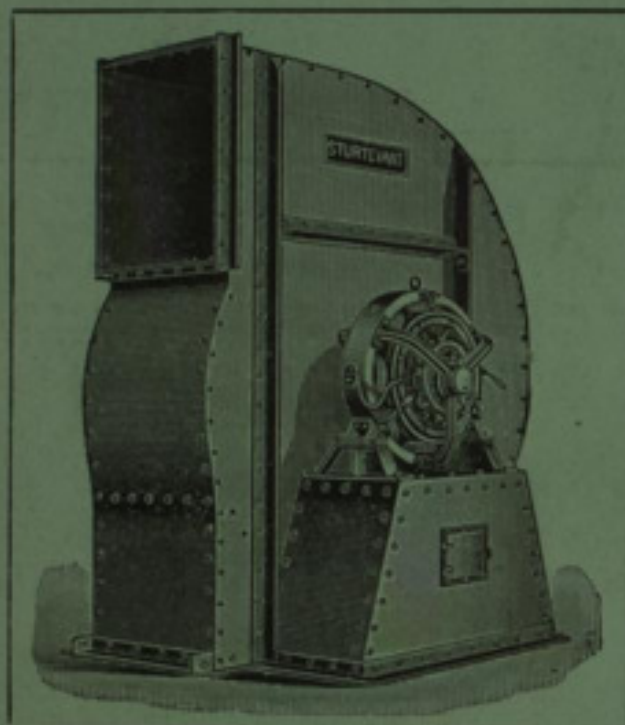
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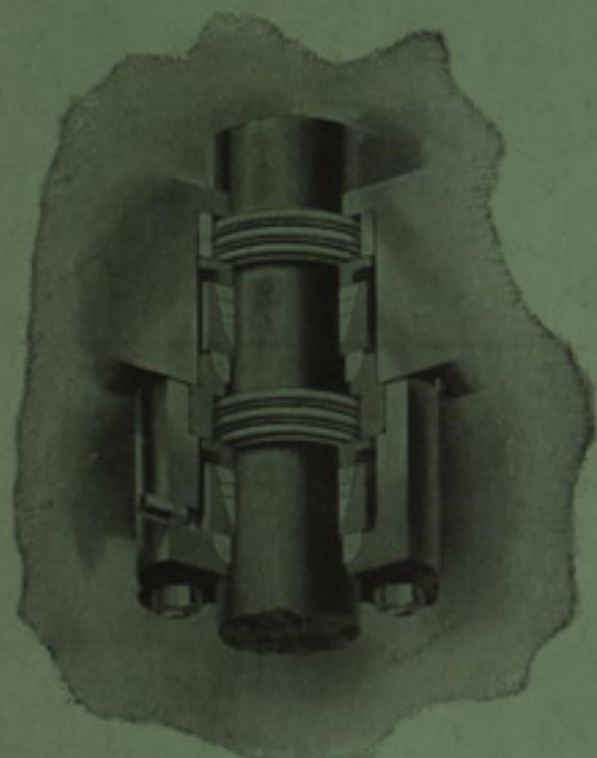
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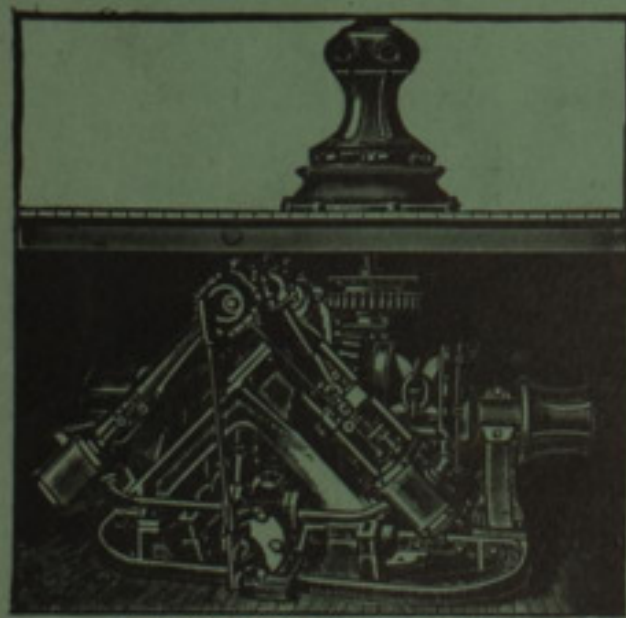
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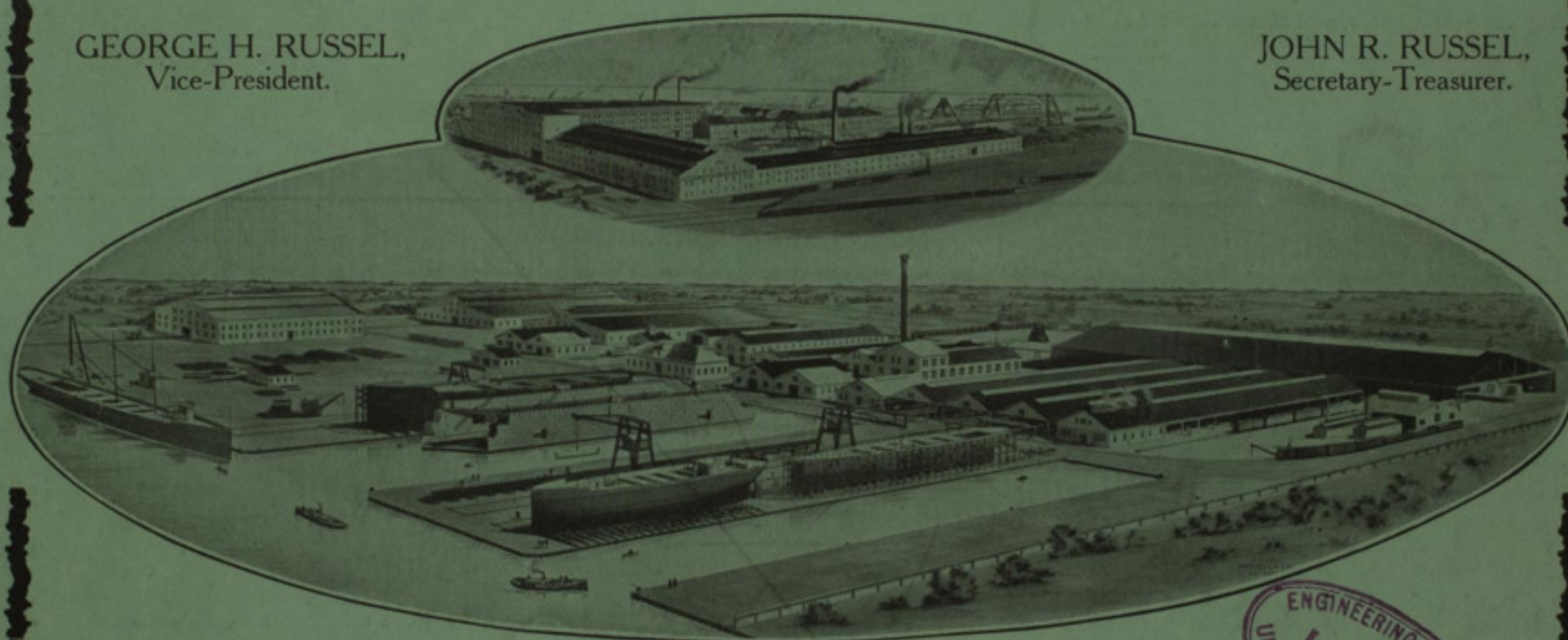
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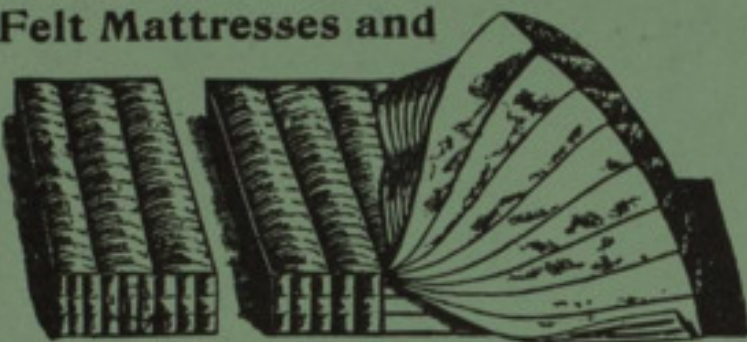
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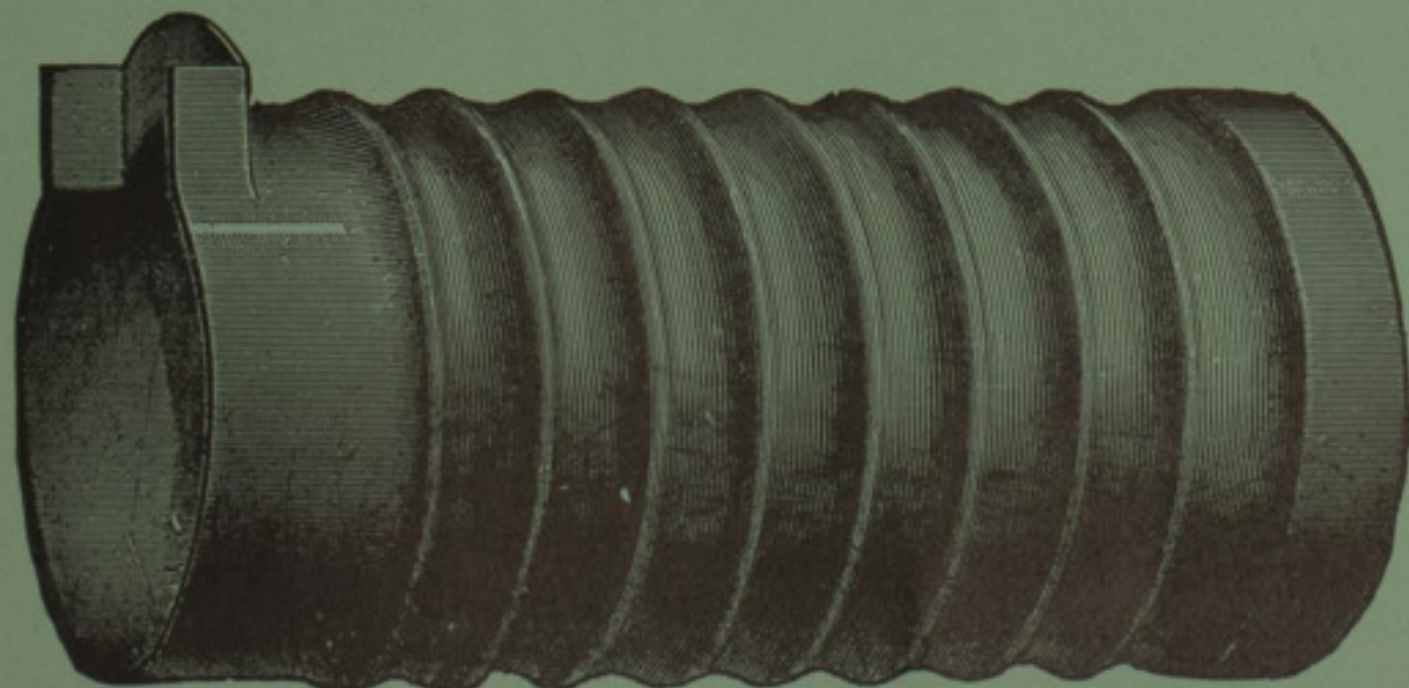
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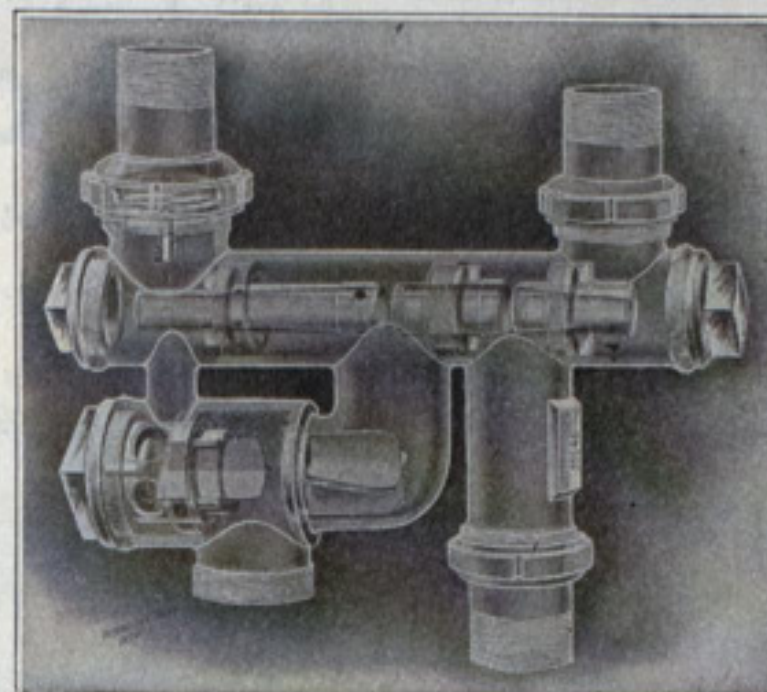
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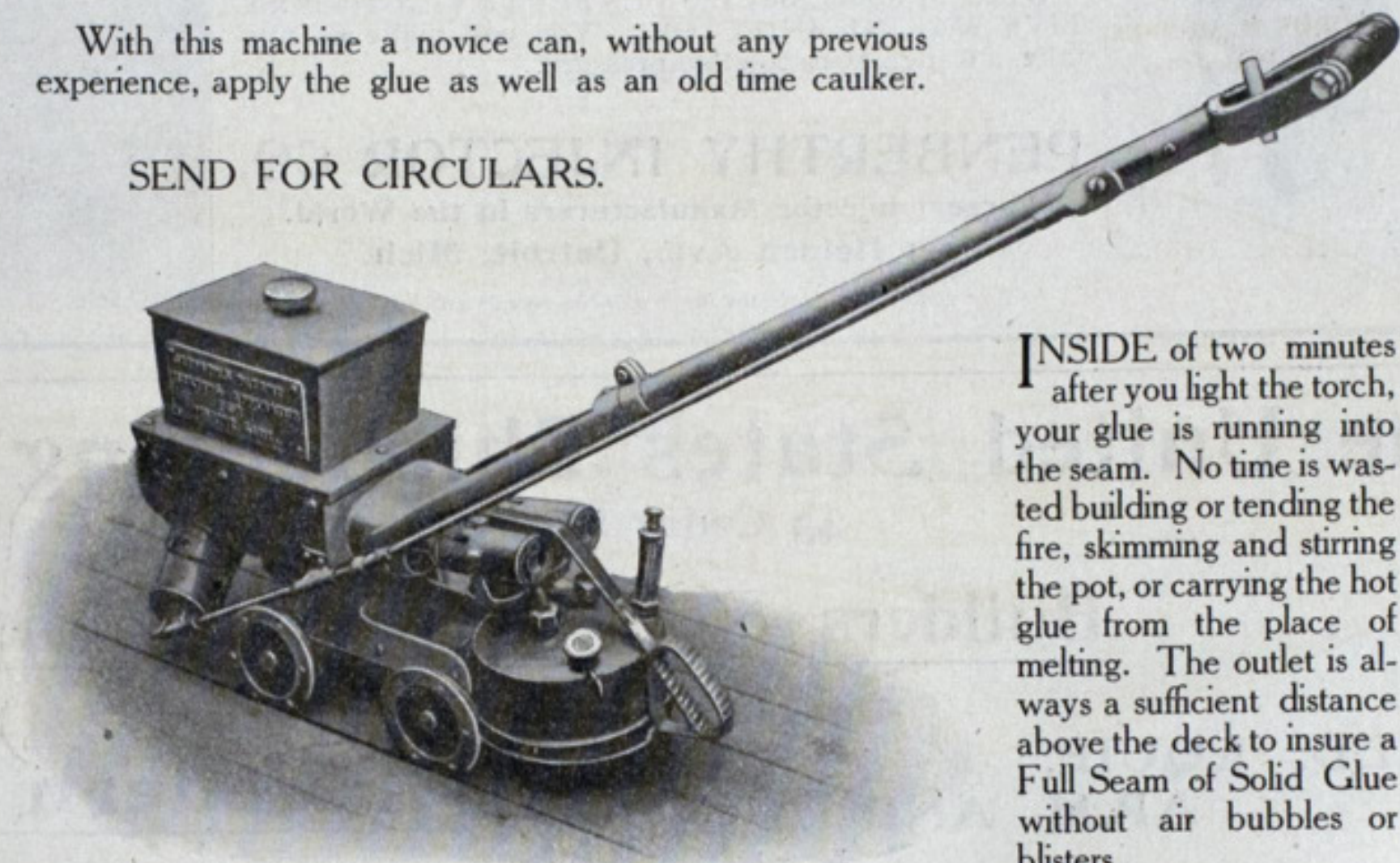
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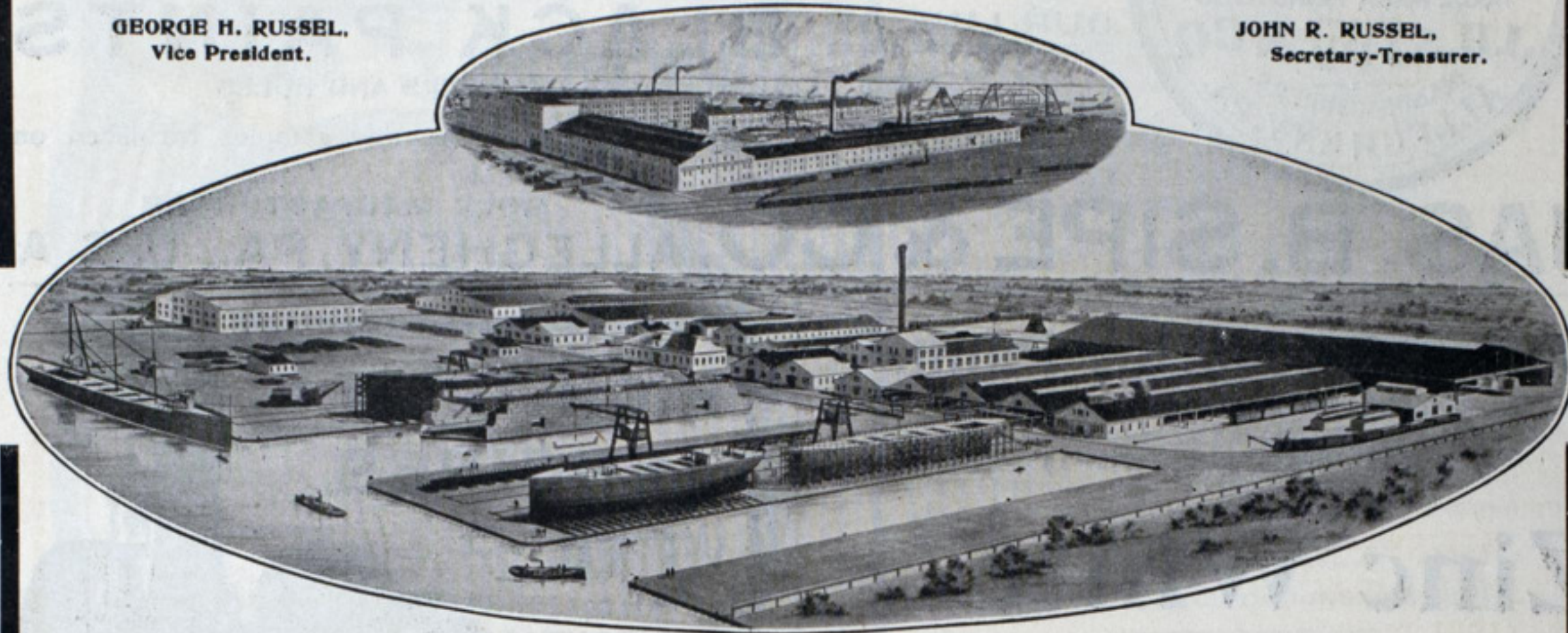
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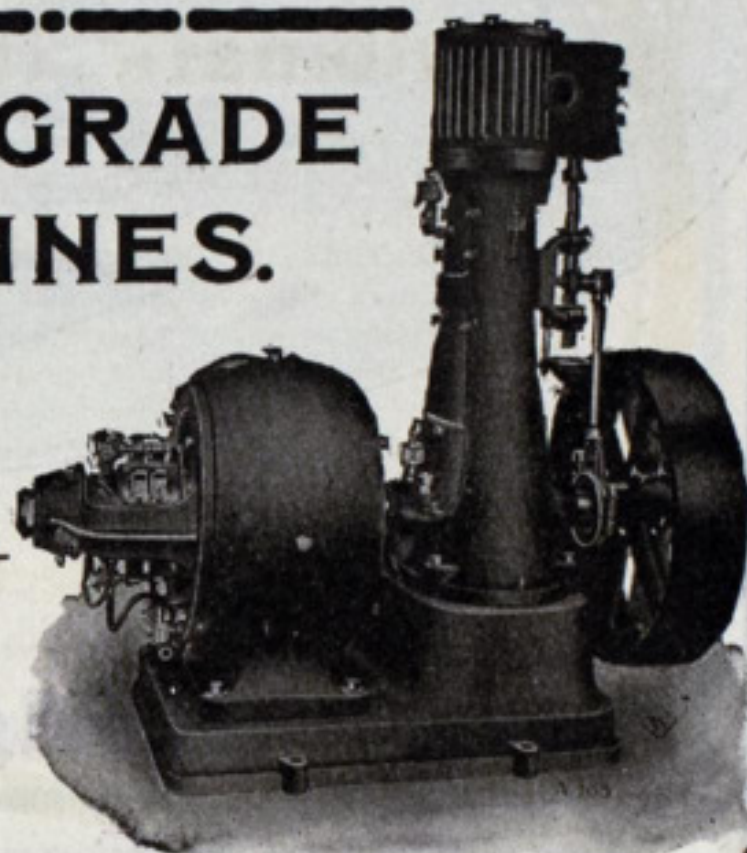
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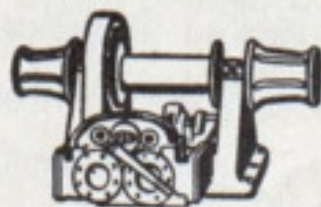
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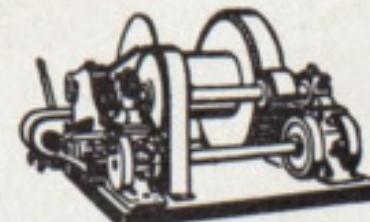
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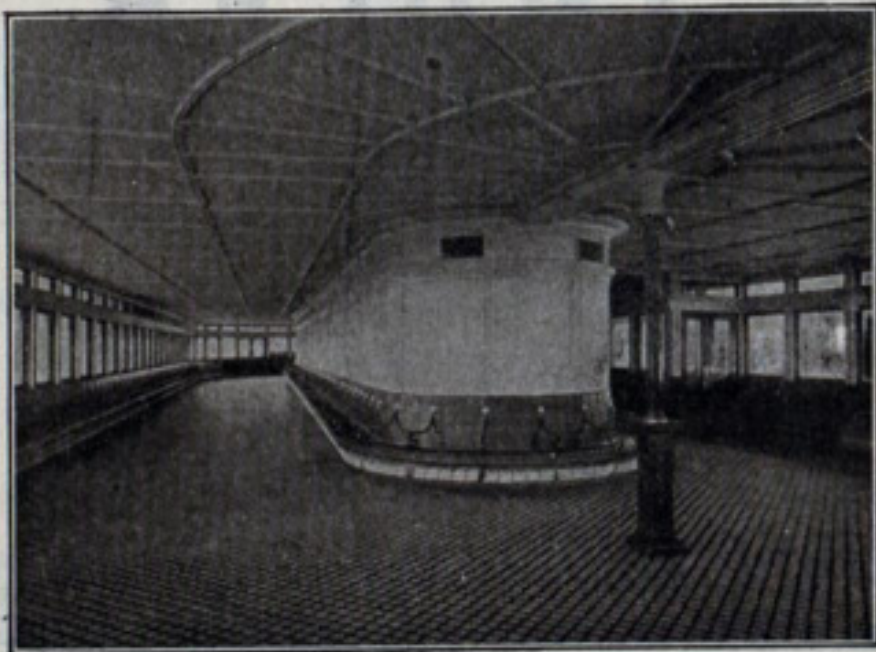
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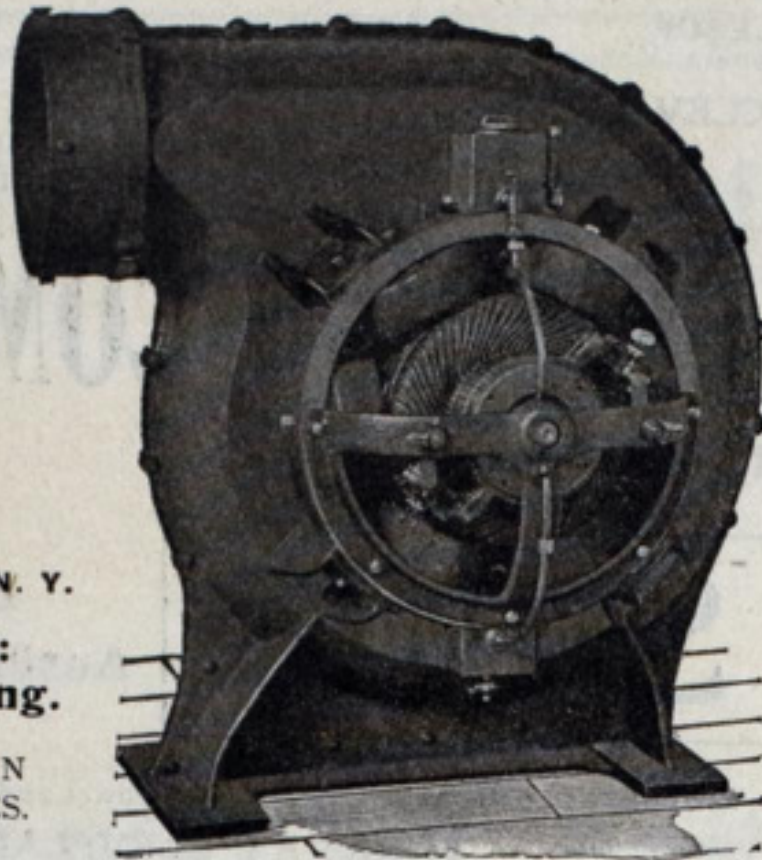
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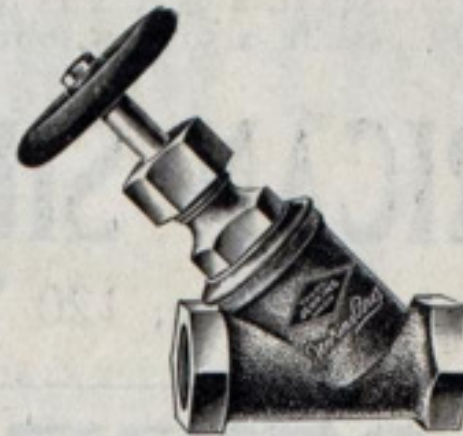
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